ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI

AUTONOMOUS

AK 19 Regulations

Year : I B.Tech **Semester :** I **Branch of Study :** Common to All

Subject Code:19ABS9901	Subject Name: Algebra and Calculus	L T P 3 1 0	Credits:4

Course Outcomes:

1.Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
2.Utilize mean value theorems to real life problems.
3.Familiarize with functions of several variables which is useful in optimization.
4.Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
5.Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

Unit I : Matrix Operations and Solving Systems of Linear Equations **12 hrs**

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.

Unit II : Quadratic Forms and Mean Value Theorems **9 hrs**

Diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.
Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);

Unit III: Multivariable calculus **9 hrs**

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

Unit IV: Multiple Integrals **10hrs**

Double integrals, change of order of integration, double integration in polar coordinates, change of Variables in double integration (Cartesian to polar), areas enclosed by plane curves. Evaluation of triple integrals.

Unit V: Special Functions **10 hrs**

Beta and Gamma functions and their properties, relation between beta and gamma functions. Bessel functions, Bessel's equation, Recurrence formulae or $J_n(x)$, Generating function-Orthoganality of Besselś functions.

1)
2) Dr R. Vijayalakshmi
3) Dr. V. K. Somasekhar
4)
5)
6)
7) P.

Textbooks:

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

References:

1. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham amd M.V.S.S.N Prasad, Mathematics – 1, S.Chand publications.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
4. N.Bali, M.Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science Press.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO3	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO4	Po2 : analyse complex engineering problems	2.1	2.1.3
CO5	Po2 : analyse complex engineering problems	2.1	2.1.3

1)

2) Dr. V Vijayalakshmi

3)

4) Dr R Vijayalakshmi

5) C. Jayasuya

6)

7) P.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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B.Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9902	Applied Physics	3	0	0	3

Course Outcomes

1. Analyze the wave properties of light and the interaction of energy with the matter.
2. Apply electromagnetic wave propagation in different guided media.
3. Asses the electromagnetic wave propagation and its power in different media
4. Analyze the conductivity of semiconductors.
5. Interpret the difference between normal conductor and superconductor and apply the nano materials for engineering applications.

Unit I : Optics and EM Theory **10 Hrs**

Interference of light -principle of superposition-Conditions for sustained
Interference-Interference in thin films (reflected light) - Newton's Rings -Determination of Wavelength. Diffraction-Fraunhofer diffraction- Single slit and double slit- Diffraction Grating.
Divergence and Curl of Electric and Magnetic Fields - Gauss' theorem for divergence and Stokes' theorem for curl - Maxwell's Equations (Quantitative) – Electromagnetic wave - propagation in non-conducting medium - Poynting's Theorem.

Unit II : Lasers and Fiber Optics **10 Hrs**

Lasers – Introduction – Characteristics – Spontaneous and Stimulated Emission – Einstein Coefficients – Population Inversion – Excitation Mechanism and Optical Resonator - He-Ne Laser -Nd:YAG Laser – Semiconductor Diode Laser – Applications of Lasers and Holography.

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 – Industrial Applications –Fiber optic Sensors.

Unit III : Dielectric and Magnetic Materials **8 Hrs**

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 memory device applications .

Unit IV: Semiconductors **8 Hrs**

Origin of Energy bands (Qualitative)-Intrinsic and Extrinsic semiconductors –Direct and indirect band gap semiconductors- Density of charge carriers – Fermi energy—Dependence of Fermi energy on carrier concentration and temperature – Electrical conductivity – Drift and Diffusion currents – Continuity equation - Hall effect - Applications of Hall effect and Semiconductors.

Unit V: Superconductors and Nanomaterials

Superconductors-Properties-Meissner'seffect-BCSTheory(Qualitative) - Josephson effect (AC&DC)-Types of Superconductors-Applications of superconductors.Nanomaterials–Significance of nanoscale–: Physical, Mechanical, Magnetic, Optical properties of nanomaterials – 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 Nanomaterials.

Textbooks:

1. M. N. Avadhanulu, P. G. Kshirsagar &TVS Arun Murthyl A Text book of Engineering Physicsl-S. Chand Publications,11th Edition2019.

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B.Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0501	Problem Solving and Programming	3	1	0	4

Course Objectives:

1. Introduce the internal parts of a computer, and peripherals.
2. Introduce the Concept of Algorithm and use 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.

Unit 2:

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

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.

Unit 3:

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 Laboratoryels.

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.

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

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.

Text Books:

1. Pradip Dey, and Manas Ghosh, –Programming in Cl, 2018, Oxford University Press.
2. R.G. Dromey, —How to Solve it by Computerl. 2014, Pearson.

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHS9901	Communicative English I	2	0	0	2

Course Outcomes:

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

1. Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
2. Formulate sentences using proper grammatical structures and correct word forms
3. Speak clearly on a specific topic using suitable discourse markers in informal discussions
4. Write summaries based on global comprehension of reading/listening texts
5. Produce a coherent paragraph interpreting a figure/graph/chart/table
6. Take notes while listening to a talk/lecture to answer questions

Syllabus

Unit 1 : EXPLORATION **10 Hours (4L+6P)**

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: A Proposal to Girdle the Earth, Nellie Bly - 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 un countable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Unit 2: ON CAMPUS **10 Hours (4L+6P)**

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: The District School As It Was by One who Went to it, Warren Burton - 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.

Unit 3: THE FUTURE OF WORK **10 Hours (4L+6P)**

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: The Future of Work** - 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.

Unit 4: FABRIC OF CHANGE **8 Hours (2L+6P)**

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: H.G.Wells and the Uncertainties of Progress, Peter J.Bowler - Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicate processes or display complicated data.

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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.

Unit 5: TOOLS FOR LIFE **8 Hours (2L+6P)**

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.

Reading: Leaves from the Mental Portfolio of a Eurasian, Sui Sin Far - 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)

Suggested books:

Text Book: English all round: Communication Skills for Under graduation Learners Vol. I, Orient BlackSwan Publisers, First Edition 2019.

Reference Books

1. 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.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

Sample Web Resources

Grammar/Listening/Writing, 1-language.com, http://www.5minuteenglish.com/, https://www.englishpractice.com/, Grammar/Vocabulary, English Language Learning Online http://www.bbc.co.uk/learningenglish/, http://www.better-english.com/, http://www.nonstopenglish.com/, https://www.vocabulary.com/, BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/, https://www.englishclub.com/reading/short-stories.htm, https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613, http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/, http://www.world-english.org/, http://learnenglish.britishcouncil.org/

Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner's dictionaries

List of COs	PO no. and keyword	Competency Indicator: Description	Performance Indicator: Description
CO1.	PO6 Apply contextual knowledge to assess societal, health, safety, legal, and cultural issues.	6.1	6.1.1
CO2.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO3.	PO9-Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1

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CO4.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1 .	10.1.1
CO5	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1
CO6.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1

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B.Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ALC0401	Electronics and Communication Engineering Workshop	0	0	2	1

Course Outcomes: Students will be able to
CO1: Identify discrete components, ICs and assemble simple electronic circuits over a PCB CO2: Testing of various components, Interpret specifications (ratings) of the component
CO3: Identify discrete components and ICs and Assemble simple electronic circuits over a PCB CO4: Disassembling and assembling a Personal Computer and make the computer ready to use CO5: Make use of Office tools for preparing documents, spreadsheets and presentations

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 (Find the Amplitude and Frequency of a signal) 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- Write important specifications/ratings of components & ICs and submit it in the form of a report) – 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. 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.

6. 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
*Provide some exercises so that students are familiarized in using Active HDL/Xilinx/Cadence tools

7. Introduction to MATLABORATORY Tools and MASM: Learning of basic functions for MATLABORATORY tools and MASM.

8. 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 availaboratoryle (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.

9. 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.

10. 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.

11. Understand working of different electronic instruments for various fields like medical instruments, telecommunication devices etc.

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

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1:Engineering knowledge	1.1	1.3.1
		1.4	1.4.1
	PO3: Design/Development of solutions	3.2	3.2.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
	PO4: Conduct investigations of complex problems	4.1	4.1.2
			4.1.3
			4.1.4
CO3	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO5: Modern tool usage	5.1	5.1.1
		5.2	5.2.1
		5.3	5.3.1
	PO10: Communication	10.1	10.1.1
CO5	PO2:Problem analysis	2.2	2.1.3

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B.Tech I Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9907	Applied Physics Laboratory	0	0	3	1.5

Course Outcomes

1. Analyze the wave properties of light and the interaction of energy with the matter.
2. Apply electromagnetic wave propagation in different guided media.
3. Asses the electromagnetic wave propagation and its power in different media
4. Analyze the conductivity of semiconductors.
5. Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.

List of Experiments

1. Determination of the thickness of the wire using wedge shape method.
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Dispersive power of a diffraction grating
5. Study of the Magnetic field along the axis of a circular coil carrying current.
6. Study the variation of B versus H of the magnetic material (B-H curve)
7. Determination of the numerical aperture of a given optical fiber and angle of acceptance.
8. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
9. Determination of the energy gap of a semiconductor
10. Determination of crystallite size using X-Ray diffraction spectra.
11. Determination of Wavelength of LASER using diffraction grating.
12. Determination of particle size using LASER.
13. Determination of the resistivity of semiconductor by Four probe method.
14. Determination of dielectric constant by charging and discharging method.
15. Study the temperature dependence of resistance of a thermister.

References:

1. S. Balasubramanian, M.N.Srinivasan, –A Text book of Practical Physicsl-S Chand Publishers, 2017.
2. http://vLaboratory.amrita.edu/index.php-VirtualLaboratorys, Amrita University.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 4: Analysis and interpretation of data	4.3	4.3.3
CO: 2	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO: 3	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO: 4	PO 4: Analysis and interpretation of data	4.3	4.3.2
CO: 5	PO 4: Analysis and interpretation of data	4.3	4.3.2

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0503	Problem Solving and Programming Laboratory	0	0	4	2

Laboratoryoratory Experiments #

1. Assemble and disassemble parts of a Computer
2. Design a C program which reverses the number
3. Design a C program which finds the second maximum number among the given list of numbers.
4. Construct a program which finds the kth smallest number among the given list of numbers.
5. Design an algorithm and implement using C language the following exchanges a ← b ← c ← d ← a
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 1and100 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. Design algorithm 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.

Instructors may add some experiments to the above list. Moreover, 50% of the experiments are to be changed every academic year. Instructors can choose the experiments, provided those experiments are not repetitions.

Course outcomes:

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 Maintenancel, Tata McGraw-Hill, 2nd edition, 2002.
2. R.G. Dromey, —How to Solve it by Computerl. 2014, Pearson.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2: Problem analysis	2.1	2.1.1
CO2	PO2: Problem analysis	2..2	2.2.2
CO3	PO2: Problem analysis	2.1	2.1.1
CO4	PO2: Problem analysis	2.3	2.3.1
CO5	PO2: Problem analysis	2.2	2.2.3

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHS9902	Communicative English - I Laboratory	0	0	2	1

Course Outcomes

1. Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
2. Apply communication skills through various language learning activities
3. Analyze the English speech sounds, stress, rhythm, intonation and sylLaboratoryle division for better listening and speaking comprehension.
4. Evaluate and exhibit acceptable etiquette essential in social and professional settings.
5. Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

SylLaboratorvus

Unit 1

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

Unit 2

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

Unit 3

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

Unit4

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

Unit 5

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

Software Source:

K-Van Solutions Software

Reference:

Teaching English - British Council

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B.Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0201	Network Theory	3	0	0	3

COURSE OUTCOMES:

CO1. Solve network problems using mesh and nodal analysis techniques
CO2. Analyze networks using Thevenin, Norton, Maximum power transfer, Superposition, Miller and Millman theorems
CO3. Compute responses of first order and second order networks using time & frequency domain analysis
CO4. Design resonant circuits for given bandwidth
CO5. Utilize z, y, ABCD and h parameters for analyzing two port circuit behavior

UNIT I: Introduction to Electrical Circuits

Passive components and their V-I relations, Energy sources - Ideal, Non-ideal, Independent and dependent sources, Source transformation Kirchoff_s laws, Star–to-Delta or Delta-to-Star Transformations, Mesh analysis and Nodal analysis problem solving, Super node and Super mesh for DC Excitations

UNIT II: Network Theorems

Superposition theorem, Thevenin & Norton theorems, Maximum power transfer theorem, Reciprocity theorem, Millman theorem, Miller Theorem, Tellegan's Theorem, Compensation theorem - problem solving using dependent sources also, Duality and dual networks.

UNIT III: Transients

First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non- homogenous, problem solving using R-L-C elements with DC excitation and AC (sinusoidal) excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method.

UNIT IV: Resonance and Coupled Circuits

Self inductance, Mutual inductance, dot rule, coefficient of coupling, Analysis of multi-winding coupled circuits, series & parallel connection of coupled inductors.

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case resistance present in both branches, anti resonance at all frequencies.

UNIT V: Two Port Networks & Network Functions

Two Port Networks, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters, hybrid and inverse hybrid parameters, relationship between parameters, interconnection of two port networks.

Concept of complex frequency, driving point and transfer functions for one port and two port network, poles & zeros of network functions, Restriction on Pole and Zero locations of network function

Text Books:

1. W. H. Hayt and J. E. Kemmerly, —Engineering Circuit Analysisl, McGraw Hill Education, 2013.
2. M. E. Van Valkenburg, —Network Analysisl, Prentice Hall, 2006.

References:

1. D. Roy Choudhury, —Networks and Systemsl, New Age International Publications, 1998.
2. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
3. Bhise, Chadda, Kulshreshtha, —Engineering network analysis and filter designl Umesh Publication, 2000.
4. Joseph Edminister and Mahmood Nahvi, —Electric Circuitsl, Schaum's Outline Series, Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2003.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO-1 –engineering knowledge	1.3	1.3.1
CO2	PO-2-problem analysis	2.2	2.2.2 &2.2.3
CO3	PO-4-conduct investigations of complex problems	4.1	4.1.1
CO4	PO-4- conduct investigations of complex problems	4.3	4.3.1
CO5	PO-1- engineering knowledge	1.4	1.4.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9906	Differential Equations and Vector Calculus	3	1	0	4

Course Outcomes:

1. Apply the mathematical concepts of ordinary differential equations of higher order.
2. Solve the differential equations related to various engineering fields .
3. Identify solution methods for partial differential equations that model physical processes .
4. Interpret the physical meaning of different operators such as gradient, curl and divergence .
5. Estimate the work done against a field, circulation and flux using vector calculus .

UNIT I: Linear Differential Equations of Higher Order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral (e^{ax}, sinax (or) cosax, X^k, $e^{ax}v$, x v(x)), method of variation of parameters, simultaneous linear equations with constant coefficients.

UNIT II: Equations Reducible to Linear Differential Equations and Applications

Cauchy's and Legendre's linear equations, Applications to simple pendulum, oscillations of a spring, L-C-R Circuit problems and Mass spring system.

UNIT III: Partial Differential Equations – First order

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.

UNIT IV: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

UNIT V: 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.

Text Books :

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.

References:

1. Dr.T.K.V.Iyengar, Engineering Mathematics-I,S.Chand publishers
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi publication,2008
4. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO2:Analyse complex engineering problems	2.1	2.1.3
CO3	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO4	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO5	PO2:Analyse complex engineering problems	2.1	2.1.3

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9904	CHEMISTRY	3	0	0	3

Course Outcomes:

1. Understand the behaviour of, and interactions between mater and energy at both the atomic and molecular levels
2. Compare the materials of construction for battery and electrochemical sensors
3. Understand the preparation, properties, and applications of thermoplastics & thermo settings, elastomers & conducting polymers.
4. HPLC and GC methods used for separation of gaseous and liquid mixtures.
5. Understand the disadvantages of using hard water and select suitable treatments domestically and industrially.

Unit 1: Structure and Bonding Models **(10 hrs)**

Planck's quantum theory, Schrodinger wave equation, significance of Ψ^1 and Ψ^2 , applications to hydrogen, particle in a box and their applications for conjugated molecules, crystal field theory – salient features – energy level diagrams for transition metal ions – splitting of orbital's in tetrahedral and octahedral complexes, magnetic properties, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 , N_2 and CO, calculation of bond order.

Unit 2: Electrochemistry and Applications **(10 hrs)**

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nern'st equation, cell potential calculations, numerical problems, concept of pH, pH meter and applications of pH metry (acid-base titrations), 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-air battery, alkali metal sulphide batteries, Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions, button cells,

Unit 3: Polymer Chemistry **(10 hrs)**

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-66, carbon fibres, Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

Unit 4: Instrumental Methods and Applications **(10 hrs)**

Principle and applications of Colorimetry, AAS, AES, UV-Viscible spectrophotometry (Beer-Lambert's law, Instrumentation ,Principles and applications of Chromatographic techniques(GC & HPLC), separation of gaseous mixtures and liquid mixtures(GC & HPLC methods).

Unit 5: Water Technology **(10 hrs)**

Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

Text books:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

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Reference books:

1. J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011.
4. Willard Merritt Dean Settle, 7 th Edition Instrumental methods for analysis

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 2	PO 1: Apply the knowledge of basic science	1.4	1.4.1
CO: 3	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 4	PO 4: Analyse complex engineering problems	2.4	2.4.4
CO: 5	PO 1: Apply the knowledge of Basic science	1.2	1.2.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0502	Data Structures	3	0	0	3

Course Objectives:

1. To teach the representation of solution to the problem using algorithm
2. To explain the approach to algorithm analysis
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

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.

Unit 3: Trees

Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B-Trees: B- Trees, B +Trees.

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.

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.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, —Fundamentals of Data Structures in Cl, 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004.
2. Alan L. Tharp, —File Organization and Processingl, Wiley and Sons, 1988.

Reference Books:

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

Course Outcomes:

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

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List of COs	PO no. and keyword	Competency	Performance Indicator
CO1	PO1: Engineering Knowledge	1.4	1.4.1
CO2	PO4: Conduct investigations of complex problems	4.1	4.1.4
CO3	PO1: Engineering Knowledge	1.3	1.3.1
CO4	PO2: Problem analysis	2.1	2.1.2
CO5	PO2: Problem analysis	2.3	2.3.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ALC0301	Engineering Workshop Practice	0	0	2	1

Course Outcomes:

CO: 1 Apply wood working skills in real world applications.
CO: 2 Build different parts with metal sheets in real world applications.
CO: 3 Apply fitting operations in various applications.
CO: 4 Apply different types of basic electric circuit connections.
CO: 5 Demonstrate soldering and brazing.

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) Bicycle tyre puncture and change of two wheeler tyre

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

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 5	PO 2: Problem analysis	2.3	2.3.2

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0301	Engineering Graphics Laboratory	1	0	4	3

Course Outcomes:

CO: 1 Draw various curves applied in engineering.
CO: 2 Show projections of solids and sections graphically.
CO: 3 Draw the development of surfaces of solids.
CO: 4 Use computers as a drafting tool.
CO: 5 Draw isometric and orthographic drawings using CAD packages.

Manual Drawing

UNIT I

Introduction to Engineering graphics: Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.

a) Conic sections including the rectangular hyperbola- general method only,
b) Cycloid, epicycloids and hypocycloid
c) Involutes

Projection of points, lines: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line.

UNIT II

Projections of Planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.
Projections of Solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

UNIT III

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.
Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Computer Aided Drafting:

UNIT IV

Introduction to AutoCAD: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions.
Dimensioning principles and conventional representations.

UNIT V

Orthographic Projections: Systems of projections, conventions and application to orthographic projections.
Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

Text Books and Reference Books:

1. K. L. Narayana & P. Kannaiah, Engineering Drawing, 3/e, Scitech Publishers
2. N. D. Bhatt, Engineering Drawing, 53/e, Charotar Publishers
3. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill
4. Shah and Rana, Engineering Drawing, 2/e, Pearson Education
5. Basant Agrawal & C. M. Agrawal, Engineering Drawing, Tata McGraw-Hill

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Additional Sources

YouTube: http-sewor,Carleton.cag.kardos/88403/drawings.html conic sections-online, red woods.edu

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 5	PO 5: Problem analysis	5.1	5.1.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0203	Network Theory Laboratory	0	0	3	1.5

COURSE OUTCOMES:
CO1.Verify Kirchhoff's laws and network theorems CO2.Measure time constants of RL & RC circuits CO3.Analyze behavior of RLC circuit for different cases CO4. Design resonant circuit for given specifications
CO5.Characterize and model the network in terms of all network parameters

List of Experiments:
Any 10 of the following experiments are to be conducted in Hardware & Simulation (Multisim/Open source software):

1. Verification of Kirchoff's Laws
2. Apply Mesh & Nodal Analysis techniques for solving electrical circuits (problems with dependent sources also)
3. Verification of Superposition & Reciprocity Theorem
4. Verification of Thevenin's and Norton's Theorem
5. Verification of Maximum Power Transfer Theorem
6. Verification of Millman and Miller Theorm
7. Measure and calculate RC time constant for a given RC circuit
8. Measure and calculate RL time constant for a given RL circuit
9. 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.

10. Design a series RLC resonance circuit. Plot frequency response and find resonance frequency , Bandwidth , Q – factor.
11. Design a parallel RLC resonance circuit. Plot frequency response and find resonance frequency , Bandwidth , Q – factor.
12. Measure and calculate Z, Y parameters of two-port network.
13. Measure and calculate ABCD & h parameters of two-port network.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO-1 –engineering knowledge	1.3	1.3.1
CO2	PO-2-problem analysis	2.2	2.2.2 &2.2.3
CO3	PO-4-conduct investigations of complex problems	4.1	4.1.1
CO4	PO-4- conduct investigations of complex problems	4.3	4.3.1
CO5	PO-1- engineering knowledge	1.4	1.4.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9909	CHEMISTRY LABORATORY	0	0	3	1.5

Course Outcomes:

1. To familiarize the students with the basic concepts of chemistry of materials
2. Prepare advanced polymer materials
3. Measure the strength of an acid present in secondary batteries
4. To familiarize with digital and instrumental methods of analysis

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method)
3. Determination of pH metric titration of strong acid vs. strong base,
4. Conductometric titration of strong acid vs. strong base
5. Determination of Fe(II) in Mohr's salt by potentiometric method.
6. Determination of percentage of Iron in Cement sample by colorimetry
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of phenol-formaldehyde resin
9. Preparation of TIO_2/ZnO nano particles
10. Estimation of Calcium in port land Cement
11. Adsorption of acetic acid by charcoal
12. Thin layer chromatography

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO:1	PO 4: Analysis and interpretation of data	4.3	4.3.3
CO:2	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO:3	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO:4	PO 4: Analysis and interpretation of data	4.3	4.3.2

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0504	Data Structures Laboratory	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.

Laboratoryoratory 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, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man 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 Laboratoryel. 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 datatype and support different operations on it.

Course Outcomes:

1. Select the data structure appropriate for solving the problem
2. Implement searching and sorting algorithms
3. Design new data types
4. Illustrate the working of stack and queue
5. Organize the data in the form of files
6.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering Knowledge	1.4	1.4.1
CO2	PO 2: Problem analysis	2.2	2.2.4
CO3	PO1: Engineering Knowledge	1.3	1.3.1
CO4	PO1: Engineering Knowledge	1.4	1.4.1
CO5	PO1: Engineering Knowledge	1.4	1.4.1

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1-2-1-ECE -File No: 2.

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AUTONOMOUS
AK 19 Regulations

Year : II **Semester :** I **Branch of Study :** ECE and EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9912	Transform Techniques and Complex Variables.	3	0	0	3

Course Outcomes:

CO1: Find the differentiation and integration of complex functions used in engineering problems
CO2: Apply the Laplace transform for solving differential equations (continuous systems)
CO3: Find the Fourier series of periodic signals
CO4: Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
CO5: Develop Z transform techniques for discrete time systems

Unit I : Laplace transforms

Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n, division by t, convolution theorem, periodic functions, unit step function, unit impulse function, applications to ordinary differential equations. (Without proofs)

Unit II: Fourier series

Dirichlet"s conditions, Fourier series, conditions for a Fourier expansion, functions of any period, odd and even functions - half range series.

Unit III: Fourier transforms

Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform, properties, convolution theorem

Unit IV: Z-Transforms

Definition of Z-transform, elementary properties, linearity property, damping rule, shifting u_n to the right and left, multiplication by n, initial value theorem, final value theorem, inverse Z-transform, convolution theorem, formation of difference equations, solution of difference equations using Z- transforms.

Unit V : Complex Variables

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate. Complex integration, Cauchy theorem (without proof), Cauchy integral formula (without proof), Taylor"s series, zeros of analytic functions, singularities, Laurent"s series, residues, Cauchy residue theorem (without proof).

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

References:

1. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N Prasad, Mathematics – II, S.Chand publications.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2 : Analyse complex engineering problems	2.1	2.1.3
CO2	PO1:Apply the knowledge of mathematics	1.1	1.1.2
CO3	PO1: Apply the knowledge of mathematics	1.1	1.1.2
CO4	PO1: Apply the knowledge of mathematics	1.1	1.1.2
CO5	PO1: Apply the knowledge of mathematics	1.1	1.1.2

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI
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AK 19 Regulations

Year : II **Semester :** I **Branch of Study :** ECE

Subject Code:19AES0505	Subject Name: Internet of Things	L 2	T 0	P 0	Credits:2

Course Outcomes:

CO1: Interpret the vision of IoT from a globalcontext.
CO2: Determine the Market perspective ofIoT.
CO3: Compare and Contrast the use of Devices, Gateways and Data Management inIoT.
CO4: Implement state of the art architecture inIoT.
CO5: Illustrate the application of IoT in Industrial Automation and identify Real World Design Constraints.

Unit-I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.

Unit-II

M2M to IoT - A Market Perspective- Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview- Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

Unit-III

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

Unit-IV

IoT Architecture-State of the Art - Introduction, State of the art.

Unit-V

IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things

TEXT BOOK:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.(ISBN-13:978-0124076846)

REFERENCE BOOKS / WEBLINKS:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (ISBN-13:978-8173719547)

2. Francis daCosta, "Rethinking the Internet of Things: A ScaLaboratoryle Approach to Connecting Everything", 1st Edition, Apress Publications, 2013. (ISBN-13: 978-1430257400)

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 5: Modern Tool Usage	5.1	5.1.1
CO: 2	PO 5: Modern Tool Usage	5.2	5.2.1
CO: 3	PO 4: Conduct investigations of complex problems	4.3	4.3.1
CO: 4	PO 3: Design/Development of Solutions	3.4	3.4.1
CO: 5	PO 6: Engineer & Society	6.1	6.1.1

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AK 19 Regulations

B. Tech II Year **Semester** : IV **Branch** : Common to all

Subject Code: 19AHS9903	Subject Name: Communicative English II	L T P 2 0 0	Credits:2

Course Outcomes

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

1. Prioritize information from reading texts after selecting relevant and useful points
2. Paraphrase short academic texts using suitable strategies and conventions
3. Make formal structured presentations on academic topics using PPT slides with relevantgraphical elements
4. Participate in group discussions using appropriate conventions and language strategies
5. Prepare a CV with a cover letter to seek internship/ job
6. Collaborate with a partner to make presentations and Project Reports

Syllabus

Unit 1 **(10 hrs)**

Listening : Listening for presentation strategies and answering questions on the speaker, audience, and key points.
Speaking: Formal presentations using PPT slides without graphic elements.
Reading: Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style.
Writing: Paraphrasing; using quotations in writing; usingacademic style - avoiding colloquial words and phrases.
Grammar and Vocabulary: Formal/academicwords and phrases.

Unit 2 **(10 hrs)**

Listening: Following an argument/ logical flow of thought; answering questions on key concepts after listening to extended passages of spoken academic discourse.
Speaking: Formal presentations using PPT slides with graphic elements.
Reading: Understand formal and informal styles; recognize the difference between facts and opinions.
Writing: Formal letter writing and e-mail writing (enquiry, complaints, seeking permission, seeking internship); structure, conventions and etiquette.
Grammarand Vocabulary: Phrasal prepositions; phrasal verbs.

Unit 3 **10(hrs)**

Listening: Identifying views and opinions expressed by different speakers while listening to

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discussions.
Speaking: Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position.
Reading: Identifying claims, evidences, views, opinions and stance/ position.
Writing: Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidences.
Grammar andVocabulary: Language for different functions such as stating a point, expressing opinion, agreeing/disagreeing, adding information to what someone has stated, and asking for clarification. **(8 hrs)**

Unit 4:

Listening: Understanding inferences; processing of information using specific context clues from the text.
Speaking: Group discussion; reaching consensus in group work (academic context).
Reading: Reading for inferential comprehension.
Writing: Applying for internship/ job - Writing one's CV/Resume and cover letter.
Grammar and Vocabulary: Active and passive voice – use of passive verbs in academic writing.

Unit 5: **(8hrs)**

Listening: Understanding inferences - processing of explicit information presented in the text andimplicit information inferable from the text or from previous/background knowledge.
Speaking: Formal team presentations on academic/ general topics using PPT slides.
Reading for Writing: Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; significance of references.
Grammar and Vocabulary: Reinforcing learning; editing short texts; correcting common errors in grammar and usage.

***Course Materials would be compiled and provided to learners and teachers**
ReferenceBooks

1. Bailey, Stephen. *Academic writing: A handbook for international students*.Routledge,2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition,2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*.CUP, 2012.Sample Web Resources Grammar/Listening/Writing 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/

Grammar/Vocabulary
English Language Learning Online, http://www.bbc.co.uk/learningenglish/, http://www.better-english.com/, http://www.nonstopenglish.com/, https://www.vocabulary.com/, BBC Vocabulary Games, Free Rice Vocabulary Game

Reading
https://www.usingenglish.com/comprehension/, https://www.englishclub.com/reading/short-stories.htm, https://www.english-online.at/

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Listening

https://learningenglish.voanews.com/z/3613, http://www.englishmedialab.com/listening.html

Sneaking

https://www.talkenglish.com/, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/, http://www.world-english.org/, http://learnenglish.britishcouncil.org/, Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner's dictionaries

References:

1.www.pointblank7.in> News & Politics> Features dt. 15.05.2019

2. Learning English a Communication Approach by Orient Longman Pvt Ltd. Hyderabad , 2005.

List of COs	PO no. and keyword	Competency Indicator:	Performance Indicator:
CO1.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1 10.1.2
CO2	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2
CO3.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.2
CO4.	PO9-Functioneffectivelyasanindividual,andasamemberorleaderindiverse teams, and in multidisciplinarysettings.	9.2	9.2.1 9.2.2 9.2.3
CO5.	PO10-Able to comprehend and write effective reports and design documentation.	10.3	10.3.1 10.3.2
CO6.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2

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B. Tech II- Year **Semester: IV** **Branch: Common to all**

Subject Code	Subject Name	L	T	P	Credit:
19AHS9904	**Communicative English II Lab**	0	0	2	1

Course Outcomes

1. Prioritize information from reading texts after selecting relevant and useful points.
2. Make formal structured presentations on academic topics using PPT slides with relevant graphical elements.
3. Participate in Group discussions using appropriate conventions and language strategies.
4. Paraphrase short academic text using suitable strategies and conventions.
5. Collaborate with a partner to make presentations and Project

Syllabus

Unit 1

Oral Presentation: Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style. Listening for presentation strategies and answering questions- Formal presentations using PPT slides without graphic elements

Unit 2

Powerpoint Presentation/Poster Presentation: Understand formal and informal styles; recognize the difference between facts and opinions.Following an argument/ logical flow of thought; answering questions, formal presentations using PPT slides with graphic elements.

Unit 3

Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position. Identifying claims, evidences, views, opinions and stance/ position. Identifying views and opinions expressed by different speakers while listening to discussions.

Unit4

Reading for inferential comprehension. Group discussion; reaching consensus in group work(academic context). Understanding inferences; processing of information using specific context clues from the text.

Unit 5

Formal team presentations on academic/ general topics using PPT slides-identifying sections in project reports; understanding the purpose of each section; significance of references.

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References:

1. Effective Technical Communication, Rizvi,Tata McGraw-Hill Education2007
2. A Practical Course in Effective English Speaking skills, J.K.Gangal, PHI Learning Pvt Ltd, 2012
3. A Course in Communication Skills, P.Kiranmai Dutt,Geetha Rajeevan,C.L.N.Prakash,2008.
4. Technical Communication, Meenakshi Raman, Oxford University Press
5. Professional Communication Skills, Er.A.K.Jain, Pravin S.R.Bhatia, Dr.A.M.Sheikh, S.Chand & Company Ltd, 2001.

List of COs	PO No. and keyword	Competency Indicator:	Performance Indicator
CO1.	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1 10.1.2
CO2.	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2
CO3.	PO9 Functioneffectivelyasanindividual,andasamember orleaderindiverse teams, and in multidisciplinarysettings.	9.2.	9.2.1 9.2.2 9.2.3
CO4.	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	10.3	10.3.1 10.3.2
CO5.	PO10 Able to comprehend and write effective reports and design documentation.	10.3	10.3.1 10.3.2

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AK 19 Regulations

B.Tech- II,III Year **Semester: I** **Branch: Common to all**

MANDATORY COURSE

Subject Code	Subject Name	L	T	P	
19AMC9902	CONSTITUTION OF INDIA	3	0	0	Credits: 0

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the Powers and functions of Governor, President, Judiciary.
5. Discuss the functions of local administration bodies.

Syllabus

Unit:1

4 hrs

History of Making of the Indian Constitution - History Drafting Committee, (Composition & Working)

Unit:2

8 hrs

Philosophy of the Indian Constitution - Preamble Salient Features

Unit:3

8hrs

Contours of Constitutional Rights & Duties - Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

Unit:4

8hrs

Organs of Governance - Parliament – Composition - Qualifications and Disqualifications - Powers and Functions - Executive, President, Governor - Council of Ministers -Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions.

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Unit:5 **8hrs**

Local Administration - District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayati raj: Introduction, PRI: ZillaPachayat - Elected officials and their roles, CEO Zilla Panchayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

Suggested books for reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 2	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 3	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 4	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 5	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2	6.1.1

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B.Tech II,III Year **Semester: I** **Branch of Study: Common to all**
MANDATORY COURSE

Subject Code	Subject Name	L	T	P	Credits: 0
19AMC9904	Professional Ethics And Human Values	3	0	0	

Course Outcomes:

1. It ensures students sustained happiness through identifying the essentials of human values and skills.
2. The students will understand the importance of Values and Ethics in their personal lives and professional careers.
3. The students will learn the rights and responsibilities as an employee, team member and a global citizen.
4. Students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
5. Students can able to develop appropriate technologies and management patterns to create harmony in professional and personal life.

Syllabus

UNIT - I: **12hrs**

Introduction to Human Values: Need, basic Guidelines, Content and Process for Value Education, Self Exploration - 'Natural Acceptance' and Experiential Validation. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities. Understanding Happiness and Prosperity correctly.

UNIT - II: **12hrs**

Understanding Harmony in the Family and Society: Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the harmony in the society (society being an extension of family). Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

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UNIT – III:

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession. 12h

UNIT – IV:

15hrs

Professional Practices in Engineering: Work Place Rights & Responsibilities, Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers – The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT – V:

12hrs

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Depletion, Pollution, Ethics in Manufacturing and Marketing, Media Ethics, War Ethics, Bio Ethics, Intellectual Property Rights.

Text Books:

1.R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

2.Professional Ethics: R. Subramanian, Oxford University Press, 2015. 3.Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

Reference Books:

1.Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

2.Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA

3.Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S PritchaMichael J Rabins, 4e , Cengage learning, 2015.

4.Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO2	PO8:Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO3	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO4	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO5	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1

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Year: II B.Tech **Semester: I** **Branch: Common to All**

Subject Code 19AMC9903	Subject Name Environmental Studies	L	T	P	Credits 0
		2	0	0	

Course Outcomes

1. Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
2. Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
3. Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
4. . Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage
5. To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

UNIT – I **18Hr**

Multidisciplinary Nature ofEnvironmental Studies: Introduction Multidisciplinary Nature of Environmental Studies Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable energy 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 sub-surface – 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-pesticides problems, water logging, salinity, case studies.

Energy resources: Renewable and non-renewable energy resources.

UNIT – II **20Hr**

Ecosystems: Concept of an ecosystem. – Structure and functions of anecosystem – 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: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity And Its Conservation : Introduction- Definition:genetic, species and ecosystem diversity – 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 Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III **10Hr**

Environmental Pollution: Definition, Causes, effects and its controlmeasures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.

Solid Waste Management: Causes, effects and control measures ofurban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.

UNIT – IV **15Hr**

Social Issues and the Environment: From Unsustainable toSustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement

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and rehabilitation of people 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 Publicawareness.

UNIT – V **10Hr**

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 – Case studies.

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

REFERENCES:

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO:1	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:2	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:3	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:4	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:5	PO1:Apply the knowledge of Basic science	1.2	1.2.1

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AK 19 Regulations

B. Tech II- Year **Semester** : II **Branch: Common to all**

Subject Code	Subject Name	L	T	P	Credit:1
19AHS9904	**Communicative English II Laboratory**	0	0	2	

Course Outcomes

1. Prioritize information from reading texts after selecting relevant and useful points.
2. Make formal structured presentations on academic topics using PPT slides with relevant graphical elements.
3. Participate in Group discussions using appropriate conventions and language strategies.
4. Paraphrase short academic text using suitable strategies and conventions.
5. ColLaboratoryorate with a partner to make presentations and Project

SylLaboratoryus

Unit 1

Oral Presentation: Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style. Listening for presentation strategies and answering questions- Formal presentations using PPT slides without graphic elements

Unit 2

Power point Presentation/Poster Presentation: Understand formal and informal styles; recognize the difference between facts and opinions. Following an argument/ logical flow of thought; answering questions, formal presentations using PPT slides with graphic elements.

Unit 3

Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position. Identifying claims, evidences, views, opinions and stance/ position. Identifying views and opinions expressed by different speakers while listening to discussions.

Unit4

Reading for inferential comprehension. Group discussion; reaching consensus in group work(academic context). Understanding inferences; processing of information using specific context clues from the text. **Unit 5**
Formal team presentations on academic/ general topics using PPT slides-identifying sections in project reports; understanding the purpose of each section; significance of references.

References:

1. Effective Technical Communication,Rizvi,Tata McGraw-Hill Education2007
2. A Practical Course in Effective English Speaking skills, J.K.Gangal, PHI Learning Pvt Ltd, 2012
3. A Course in Communication Skills, P.KiranmaiDutt,GeethaRajeevan,C.L.N.Prakash, 2008.
4. Technical Communication, Meenakshi Raman, Oxford University Press
5. Professional Communication Skills, Er.A.K.Jain, Pravin S.R.Bhatia, Dr.A.M.Sheikh, S.Chand& Company Ltd, 2001.

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List of COs	PO No. and keyword	Competency Indicator:	Performance Indicator
CO1.	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1 10.1.2
CO2.	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2
CO3.	PO9 Functioneffectivelyasanindividual,andasamember orleaderindiverse teams, and in multidisciplinarysettings.	9.2.	9.2.1 9.2.2 9.2.3
CO4.	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	10.3	10.3.1 10.3.2
CO5.	PO10 Able to comprehend and write effective reports and design documentation.	10.3	10.3.1 10.3.2

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Year: II **Semester: I** **Branch of Study: ECE**

Course Code	Course Title	L	T	P	Credits
19AES0506	Internet of Things (IoT) Laboratory	0	0	2	1

Course Outcomes: Students will be able to
CO1: Choose the sensors and actuators for an IoT application. CO2: Select protocols for a specific IoT application
CO3: Utilize the cloud platform and APIs for IoT application.
CO4: Experiment with embedded boards for creating IoT prototypes. CO5: Design a solution for a given IoT application.

Laboratory of Experiments:

1. Select any one development board (Eg., Arduino or Raspberry Pi) and control LED using the board.
2. Using the same board as in (1), read data from a sensor. Experiment with both analog and digital sensors.
3. Control any two actuators connected to the development board using Bluetooth.
4. Read data from sensor and send it to a requesting client. (using socket communication) Note: The client and server should be connected to same local area network.
5. Create any cloud platform account, explore IoT services and register a thing on the platform.
6. Push sensor data to cloud.
7. Control an actuator through cloud.
8. Access the data pushed from sensor to cloud and apply any data analytics or visualization services.
9. Create a mobile app to control an actuator.
10. Identify a problem in your local area or college which can be solved by integrating the things you learned so far and create a prototype to solve it (Mini Project).

Text Book:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012

References:

1. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
2. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

Additional Sources: https://www.arduino.cc/ https://www.raspberrypi.org/

COs	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 5: Modern tool usage	5.1	5.1.1
CO2	PO 5: Modern tool usage	5.2	5.2.1
CO3	PO 4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO 3: Design/Development of solutions	3.4	3.4.1
CO5	PO 6: The engineer and society	6.1	6.1.1

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Year: II **Semester: I** **Branch of Study: ECE**

Course Code	Course Title	L	T	P	Credits
19APC0405	Signals and Systems Laboratory	0	0	3	1.5

Course Outcomes: Students will be able to

CO1: Understand basics of MATLABORATORY syntax, functions and programming.

CO2: Generate and characterize various signals and perform the basic operations.

CO3: Design and analyze linear time-invariant (LTI) systems and compute its response. CO4: Analyze the spectral characteristics of signals using Fourier analysis.

CO5: Analyze the systems using Laplace transform and Z-transform.

List of Experiments:

1. Write program to generate Standard Signals/Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write 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 program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write program to convolve two discrete time sequences. Plot all the sequences.
6. Write program to find autocorrelation and cross correlation of sequences.
7. Write program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System.
8. Write 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 program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
11. Write program for removal of noise by Autocorrelation / Cross correlation
12. Write a program for waveform Synthesis using Laplace Transform and To plot pole-zero diagram in S-plane / Z-plane of given signal/sequence

Note: All the experiments are to be simulated using MATLABORATORY or equivalent software

Text Books:

B.P. Lathi, Linear Systems and Signals, 2nd Edition, Oxford University Press, India. Barry Van Veen& Simon Haykin "Signals and Systems, 2 nd Edition" Willey Publishers

Oppenheim, Alan S. Willsky, S. Hamid Nawab, "Signals and Systems". 2nd□ Edition, PHI, India.

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CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 3: Design/Development of Solutions	3.3	3.3.1
			3.3.2
	PO 4: Conduct investigations of complex problems	4.3	4.3.1
			4.3.2
			4.3.3.
			4.3.4
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.4	2.4.1
			2.4.2
			2.4.3
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO3	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
	PO 10: Communication	10.3	10.3.1
			10.3.2
CO4	PO 4: Conduct investigations of complex problems	4.2	4.2.1
			4.2.2
		4.3	4.3.1
			4.3.2
			4.3.3
			4.3.4
CO5	PO 3: Design/Development of solutions	3.3	3.3.1
			3.3.2
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2

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Year : II **Semester :** I **Branch of Study :** ECE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0509	Basics of Python Programming	2	0	0	2

Course Outcomes:
Student should be able to
CO1: Apply the features of Python language in various real applications.
CO2: Select appropriate data structure of Python for solving a problem.
CO3: Design object-oriented programs using Python for solving real-world problems.
CO4: Apply modularity to programs.
CO5: Select appropriate classes and functions of Python for solving a problem.

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.

Unit – II

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.
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.

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.
Case Study: Reading word lists, Search, Looping with indices.
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.

Unit – IV

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables. Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.
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.

Unit – V

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning
Classes and Methods: Object oriented features, Printing objects, The init method, Thestrmethod, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

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The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args.

Text books:

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O"Reilly, 2016.

Reference Books:

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

COs	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 5: Modern tool usage	5.1	5.1.1
CO2	PO 5: Modern tool usage	5.2	5.2.1
CO3	PO 4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO 3: Design/Development of solutions	3.4	3.4.1
CO5	PO 6: The engineer and society	6.1	6.1.1

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Year: II **Semester: II** **Branch of Study: ECE**

Course Code	Course Title	L	T	P	Credits
19AES0302	Design Thinking and Product Innovation	2	0	0	2

Course Outcomes:

CO1. Generate and develop different design ideas.
CO2. Appreciate the innovation and benefits of design thinking.
CO3.Develop innovative products or services for a customer base using ideation techniques.
CO4. Build prototypes for complex problems using gathered user requirements.
CO5.Improve prototype by testing it with a specific set of users for making it sustainable by following ethics

UNIT I: ENGINEERING DESIGN

Introduction to design, characteristics of successful product development, product development process, identification of opportunities, product planning, Innovation in product development.

UNIT II: **DESIGN THINKING PROCESS**

Design thinking: Introduction, Principles, the process, Innovation in design thinking, benefits of Design thinking, design thinking and innovation, case studies

UNIT III: IDEATION

Idea generation: Introduction, techniques, Conventional methods, Intuitive methods, Brainstorming, Gallery method, Delphi method, Synectics, etc Select ideas from ideation methods, case studies

UNIT IV: PROTOTYPING

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype

UNIT V: TESTING PROTOTYPES

Prototyping for digital products: What's unique for digital, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users.

TEXTBOOKS:

1. Christoph Meinel and Larry Leifer, "Design Thinking", Springer, 2011
2. Kathryn McElroy, —Prototyping for Designers: Developing the best Digital and Physical Products, O'Reilly,2017.

REFERENCES:

1. https://www.interaction-design.org/literature/article/5-stages-in-the-design- thinking-process
2. https://www.ibm.com/design/thinking/page/toolkit
3. https://www.interaction-design.org/literature/article/define-and-frame-your-design- challenge-by-creating-your-point-of-view-and-ask-how-might-we
4. https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
5. https://nptel.ac.in/courses/109/104/109104109/
6. https://nptel.ac.in/courses/110106124/

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	**PO 3:** Design/Development of Solutions	3.3	3.3.1
CO: 2	**PO 2:** Problem analysis	2.1	2.1.3
CO: 3	**PO 3:** Design/Development of Solutions	3.2	3.2.1
CO: 4	**PO 3:** Design/Development of Solutions	3.1	3.1.1 3.1.5
CO: 5	**PO 4:** Conduct investigations of complex problems	4.3	4.3.1

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Year:II **Semester: II** **Branch of Study: ECE**

Course Code	Course Name	L	T	P	Credits
19APC0407	Analog Electronic Circuits Laboratory	0	0	3	1.5

Course Outcomes: Students will be able to
CO1: Design multi stage amplifiers using BJT and FET.
CO2: Design high frequency model and analyze its frequency responses. CO3: Design feedback amplifiers and oscillators along with design.
CO4: Understand different power amplifiers and find their conversion efficiency CO5: Designtuned amplifiers and their effect on bandwidth and stability

List of Experiments:

PART A: List of Experiments :(Minimum of Ten Experiments has to be performed)

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt"s Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

PART B: Equipment required for Laboratoryoratory Software:

i. Multisim/ Pspice/Equivalent Licensed simulation software tool
ii. Computer Systems with required specifications

Hardware:

13. Regulated Power supplies
14. Analog/Digital Storage Oscilloscopes
15. Analog/Digital Function Generators
16. Digital Multimeters
17. Decade Résistance Boxes/Rheostats
18. Decade Capacitance Boxes
19. Ammeters (Analog or Digital)
20. Voltmeters (Analog or Digital)
21. Active & Passive Electronic Components
22. Bread Boards

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23. Connecting Wires
24. CRO Probes etc.

Note: The students are required to design the electronic circuit and they have to perform the analysis through simulator using Multisim/Pspice/Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware Laboratoryoratory.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO3	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO4	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1

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Year : II	Semester : II	Branch of Study : ECE	
Subject Code:19ABS9920	Subject Name: Probability and Random variables	L T P 3 0 0	Credits:3

Course Outcomes:

1) Able to know the fundamental concepts of Probability theory
2) Analyze continuous and discrete-time random processes
3) Analyze the concepts of a Random Variable and operations that may be performed on a single Random variable
4) Analyze the characterize probability models and function of random variables based on multiples random variables.
5) Understand the concepts of expected Value of a Function of Random Variables and Gaussian Random Variables

UNIT I :PROBABILITY

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, and Independent Events.

UNIT II :THE RANDOM VARIABLE:

Definition of a Random Variable, Conditions for a function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions and their Properties-Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh distributions. Conditional Distribution. Methods of defining Conditioning Event, Conditional Density, Properties.

UNIT III: OPERATION ON ONE RANDOM VARIABLE –EXPECTATIONS:

Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

UNIT IV:MULTIPLE RANDOM VARIABLES:

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

UNIT V: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, Transformations of Multiple Random Variables, linear Transformations of Gaussian Random Variables.

1) G. SUNIL
2) Dr. R Vijayalakshmi.
3) D.N.V.K. Sarma
4)
5) C. Jay Shyam
6)
7) P.

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Text Books:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", TMH, 4th Edition, 2001.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes",
   PHI, 4th Edition, 2002.

References:

1. R.P. Singh and S.D. Sapre, "Communication Systems Analog & Digital", TMH, 1995
2. Henry Stark and John W.Woods, "Probability and Random Processes with Applications to Signal Processing",Pearson Education, 3rd Edition.
3. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis", Oxford, 3rd Edition, 1999.
4. S.P. Eugene Xavier, "Statistical Theory of Communication", New Age Publications, 2003.
5. Probability Theory and Stochastic Processes-Mallikarjuna Reddy,cengage Learning

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics	1.1	1.1.2
CO2	PO2: Identify, formulate, analyse complex engineering problems.	2.4	2.4.3
CO3	PO1: Apply the knowledge of mathematics	1.1	1.3.1
CO4	PO2: Identify, formulate, analyse complex engineering problems.	2.2	2.1.3
CO5	PO2: Identify, formulate, analyze complex engineering problems.	2.2	2.2.2

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II.B.Tech Semester: II Branch: Common to ALL

Subject Code	Subject Name	L	T	P	Credits 0
19AMC9901	Biology For Engineers	2	0	0	

Course Outcomes:

1. Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
2. Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.
3. Brief about human physiology.
4. Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
5. Know about application of biological principles in different technologies for the production of medicines and pharmaceutical molecules through transgenic microbes, plants and animals.

Unit I: Introduction to Basic Biology **(10 hrs)**

Evolution: Different patterns of evolution, Darwin"s theory of evolution, 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, Brief introduction to five kingdoms of classification, Tissue Engineering.

Unit II: Introduction to Biomolecules **(10hrs)**

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

Unit III: Human Physiology **(08hrs)**

Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle, Central Nerves System and Excretory system.

Unit IV: Introduction to Molecular Biology and recombinant DNA Technology **(08hrs)**

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. DNA technology. Introduction to gene cloning.

Unit V: Application of Biology **(10 hrs)**

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, Properties and Classification of virus, Immune response to virus, Definitions-Pandemic, Epidemic and outbreak, pandemic alert system ranges, Prevention of pandemic disease and pandemic preparation.

Text books:

1. P.K.Gupta, Cell and Molecular Biology, 5th Edition, Rastogi Publications
2. U. Satyanarayana. Biotechnology, Books & Allied Ltd 2017

Reference Books:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A Global Approach", Pearson Education Ltd, 2018.
2. T Johnson, Biology for Engineers, CRC press, 2011
3. J.M. Walker and E.B. Gingold, Molecular Biology and Biotechnology 2nd ed.. Panima Publications. PP 434.
4. David Hames, Instant Notes in Biochemistry –2016
5. Phil Tunner, A. Mctennan, A. Bates & M. White, Instant Notes – Molecular Biology – 2014.
6. Richard Dawkins, River Out of Eden: A Darwinian View of Life

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO1:Apply the knowledge of basic science	1.2	1.2.1
CO: 2	PO1:Apply the knowledge of basic science	1.2	1.2.1
CO: 3	PO1:Apply the knowledge of basic science	1.2	1.2.1
CO: 4	PO1:Apply the knowledge of basic science	1.2	1.2.1
CO: 5	PO1:Apply the knowledge of basic science	1.2	1.2.1

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B. Tech III Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0401	INFORMATION THEORY AND CODING	3	0	0	3

Course Outcomes (COs): At the end of the course, students will be able to
CO1. Understand the principles behind modeling data and develop data compression algorithms
CO2. Analyze and design data compression algorithms for text, speech and image and multimedia
CO3. Understand the need for channel coding and design efficient channel coders
CO4. Understand multimedia coding techniques.
CO5. Recognize error control coding and decoding procedures.

UNIT I:
INFORMATION ENTROPY FUNDAMENTALS
Uncertainty - Information and Entropy - Source coding Theorem - Shannon Fano coding – Huffmancoding: static and dynamic - Discrete Memory less channels - Channel coding Theorem –Channelcapacity - Channel capacity Theorem.

UNIT II :
DATA AND VOICE CODING
Differential Pulse code Modulation - Adaptive Differential Pulse Code Modulation – Delta Modulation - Adaptive Delta Modulation - Adaptive subband coding - Coding of speech signal at low bit rates - Linear Predictive Coding.

UNIT III :
IMAGE CODING
Image Compression - Types: spatial, transform based - Bit plane coding - DCT, Walsh, and Hadamard Transforms for compression - Graphics Interchange format - Tagged Image File Format -Digitized Pictures - JPEG standards.

UNIT IV :
MULTIMEDIA CODING
Perceptual coding - MPEG audio coders - Dolby audio coders - Video compression - Principles - H.261 and MPEG Video.

UNIT V :
ERROR CONTROL CODING
Linear Block codes - Syndrome Decoding- Minimum distance consideration - Cyclic codes - Generator Polynomial - Parity check polynomial - Encoder for cyclic codes - Calculation of syndrome- Convolutional Coding - Decoding using Viterbi Algorithm

TEXT BOOKS:

1. Simon Haykin, Communication Systems, John Wiley and Sons, 4th Edition, 2014.
2. Fred Halsall, Multimedia Communications, Applications Networks Protocols and Standards, Pearson Education, 2012.

REFERENCE(S):

1. Mark Nelson, Data Compression Book, BPB Publication, 2010.
2. Rafael C.Gonzalez and Richard E.Woods, Digital image processing, PHI, 2013.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1:Engineering knowledge	1.4	1.4.1
CO2	PO4:Conduct investigations of complex problems	4.2	4.2.2
CO3	PO3: Design/Development of Solutions	3.1	3.1.6
CO4	PO3: Design/Development of Solutions	3.1	3.1.6
CO5	PO2:Problem analysis	2.2	2.2.2

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0403	COMPUTER SYSTEM ARCHITECTURE	3	0	0	3

Course Outcomes:

CO1. Students should be able to understand instructions and addressing modes of a computer system.
CO2. Students should be able to Design arithmetic and logic unit.
CO3. Students should be able to Design and analysis pipelined control units.
CO4. Students should be able to Understand parallel processing architectures.
CO5. Students should be able to Evaluate performance of memory systems

UNIT I: OVERVIEW & INSTRUCTIONS:

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing modes

UNIT II: ARITHMETIC OPERATIONS:

ALU - Addition and subtraction – Multiplication – division (Fixed point and floating point); Conversion between integer and real numbers; The generation of higher order functions from square roots to transcendental functions; Representation of non-numeric data (character codes, graphical data)

UNIT III: PROCESSOR AND CONTROL UNIT:

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV: PARALLELISM:

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors.

UNIT V: MEMORY AND I/O SYSTEMS:

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

Textbooks:

1. David A. Patterson and John L. Hennessey, "Computer organization and design", Morgan Kauffman / Elsevier, Fifth edition, 2014.
2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI th edition, Mc Graw-Hill Inc, 2012.

References:

1. William Stallings "Computer Organization and Architecture" , Seventh Edition , Pearson Education, 2006.
2. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
3. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.
4. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata Mc Graw Hill, 1998.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.4	1.4.1
CO: 2	PO 3: Design/Development of Solutions	3.4	3.4.2
CO: 3	PO 3: Design/Development of Solutions	3.4	3.4.2
CO: 4	PO 1: Engineering knowledge	1.4	1.4.1
CO: 5	PO 2: Problem analysis:	2.4	2.4.2

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Course Code	Course Title	L	T	P	Credits
19AOE0501	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

Course Outcomes (CO):

After completion of the course, students will be able to

- Design a database for a real-world information system
- Define transactions that preserve the integrity of the database
- Generate tables for a database
- Organize the data to prevent redundancy
- Pose queries to retrieve the information from the database.

UNIT - I Introduction, Introduction to Relational Model 9Hrs

Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators, Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations

UNIT - II Introduction to SQL, Advanced SQL **9 Hrs**

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL: Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization.

Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages.

UNIT - III Database Design and the E-R Model, Relational Database Design **8Hrs**

Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues.

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.

UNIT - IV Query Processing, Query optimization **8 Hrs**

Query Processing: Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions.

Query optimization: Overview, Transformation of Relational Expressions, Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.

UNIT - V Transaction Management, Recovery System, Indexing and Hashing **10Hrs**

Transaction Management: Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements.

Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations.

Indexing and Hashing: Basic Concepts, Ordered Indices, B+-Tree Index Files, Multiple-Key Access

Static Hashing, Dynamic Hashing, Bitmap Indices, Index Definition in SQL

Textbooks:

1. A.Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts",6/e, TMH 2019

Reference Books:

1. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning.
3. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH

Online Learning Resources:

https://onlinecourses.nptel.ac.in/noc21_cs04/preview

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AOE0502	OPERATING SYSTEMS	3	0	0	3

Course Objectives:

- To make the students understand the basic operating system concepts such as processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection.
- To get acquaintance with the class of abstractions afford by general purpose operating systems that aid the development of user applications.

Course Outcomes:

- Able to use operating systems effectively.
- Write System and application programs to exploit operating system functionality.
- Add functionality to the exiting operating systems
- Design new operating systems

UNIT I

Operating Systems Overview: Operating system functions, Operating system structure, operating systems Operations, protection and security, Computing Environments, Open- Source Operating Systems
System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.
Processes: Process concept, process Scheduling, Operations on processes, Inter process Communication, Examples of IPC systems.

UNIT II

Threads: overview, Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.
Process Synchronization: The critical-section problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors, Synchronization examples, Alternative approaches.
CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation.

UNIT III

Memory Management: Swapping, contiguous memory allocation, segmentation, paging, structure of the page table.
Virtual memory: demand paging, page-replacement, Allocation of frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory
Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

UNIT IV

Mass-storage structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.
File system Interface: The concept of a file, Access Methods, Directory and Disk structure, File system mounting, File sharing, Protection.
File system Implementation: File-system structure, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space management.

UNIT V

I/O systems: I/O Hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O requests to Hardware operations.
Protection: Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights, Capability- Based systems, Language – Based Protection
Security: The Security problem, Program threats, System and Network threats, Cryptography as a security tool, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer–security classifications.

Text Books:

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1. Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley , Eight Edition, 2014.

Reference Books:

1. Operating systems by A K Sharma, Universities Press,
2. Operating Systems, S.Haldar, A.A.Aravind, Pearson Education.
3. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI.
4. Operating Systems, A.S.Godbole, Second Edition, TMH.

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Year: III **Semester: I** **Branch of Study: ECE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AOE0202	PROGRAMMABLE LOGIC CONTROLLERS	3	0	0	3

COURSE OUTCOMES

1. Understand the purpose, functions, and operations of a PLC and Identify the basic components of the PLC and how they function
2. View a directory of processor files using PLC software and Ability to gain knowledge on Programmable Logic Controllers
3. Will understand different types of Devices to which PLC input and output modules are Connected and To provide the knowledge about understand various types of PLC registers
4. Able to create ladder diagrams from process control descriptions
5. Ability to apply PLC timers and counters for the control of industrial processes. Able to use different types PLC functions, Data Handling Function

UNIT - I

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT - II

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT - III

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT - IV

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT - V

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

Text Books:

1. "John W Webb and Ronald A Reiss", Programmable Logic Controllers – Principle and Applications, PHI, 5th Edition 2003.
2. "JR Hackworth and F. D Hackworth Jr", Programmable Logic Controllers – Programming Method and Applications by - Pearson, 2004

Reference Books:

1. "W. Bolton", Programmable Logic Controllers, Newnes, 4th Edition 2000.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.3	1.3.1
CO3	PO2: Problem analysis	2.4	2.4.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO5	PO1: Engineering knowledge	1.3	1.3.1

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Course Code	Course Title	L	T	P	Credits
19APC0414	DIGITAL ELECTRONICS AND LOGIC DESIGN LABORATORY	0	0	2	1

Course Outcomes:
CO1: Verify the Basic Logic Gates
CO2: Verify the Universal gates
CO3: Design combinational logic circuits
CO4: Design sequential logic circuits
CO5: Design Sequential Circuits

Minimum of Ten experiments to be conducted

1. Verification of Basic Logic Gates
2. Realization of basic gates using Universal Gates
3. Half adder and Full Adder
4. Half Subtractor and Full Subtractor
5. Parallel Adder/Subtractor
6. Code Converters
7. Encoder/Decoder
8. Flip-Flops
9. Shift Registers
10. Counters
11. Johnson/Ring Counters
12. Sequence Generator

CO	PO	CI	PI
CO1	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO2	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO3	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO4	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO5	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0415	ANALOG AND DIGITAL COMMUNICATIONS LABORATORYORATORY	0	0	2	1

Course Outcomes:

CO1: Generate the characteristics of different analog modulation schemes.
CO2: Analyze different pulse modulation schemes.
CO3: Study the characteristics of Multiplexing.
CO4: Ability to design different digital modulation schemes.
CO5: Ability to analyze and design digital carrier modulation schemes.

Minimum of Ten experiments to be conducted (Five from each Part-A&B)

ANALOG COMMUNICATIONS (PART – A)

1. Amplitude Modulation
2. Frequency Modulation
3. Pulse Amplitude Modulation
4. Pulse Width Modulation
5. Pulse Position Modulation
6. Time division multiplexing.

DIGITAL COMMUNICATIONS (PART – B)

1. Pulse code modulation.
2. Delta modulation.
3. Amplitude shift keying
4. Frequency shift keying.
5. Phase shift keying.
6. Differential phase shift keying.

Equipment required for Laboratoryoratories:

1. RPS - 0 – 30 V
2. CROs - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators (3 Nos.) 0 – 1000 M Hz.
5. Multimeters
6. Laboratory Experimental kit for Pulse Code Modulation
7. Required Electronic Components (Active and Passive) which include required ICs
8. Arbitrary Wave form generators/ PNS generators – 2 Nos.

CO	PO	CI	PI
CO1	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO2	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO3	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO4	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO5	PO1:Engineering knowledge	1.3	1.3.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0419	MICROWAVE ENGINEERING AND OPTICAL COMMUNICATIONS	3	0	0	3

Course Outcomes:

CO1: Ability to analyze micro-wave circuits incorporating hollow, dielectric and planar waveguides, transmission lines, filters and other passive components, active devices.
CO2: Ability to Use S-parameter terminology to describe circuits and to explain how microwave devices and circuits are characterized in terms of their "S"- Parameters.
CO3: Ability to analyze the operation of Microwave tubes like klystron, magnetron, travelling wave tube and to measure the different parameters of microwave test bench setup.
CO4: Ability to understand the Optical sources, detectors and their working principle.
CO5: Ability to analyze the channel impairments like losses and dispersion.

UNIT-I

MICROWAVE TRANSMISSION LINES: Introduction, Microwave spectrum and bands, applications of Microwaves. Rectangular Waveguides-Solution of Wave Equation in Rectangular Coordinates, TE/TM mode analysis, Expressions for fields, Characteristic equation and cutoff frequencies, filter characteristics, dominant and degenerate modes, sketches of TE and TM mode fields in the cross-section. Mode characteristics- Phase and Group velocities, wavelengths and impedance relations, Illustrative Problems.
MICROWAVE SOLID STATE DEVICES: Introduction, classification, applications, Transfer Electronic Devices, Gunn diode-principles, RWH theory, characteristics, basic modes of operation - Gunn oscillation modes.

UNIT-II

WAVEGUIDE COMPONENTS AND APPLICATIONS: Coupling mechanisms- probe, loop, aperture types. Wave guide discontinuities-waveguide Windows, tuning screws and posts, matched loads. Waveguide attenuators-resistive card, rotary vane Attenuators; waveguide phase shifters-dielectric, rotary vane phase shifters. Wave guide multiport junctions and scattering parameters-E plane and H plane Tees, Magic Tee, Directional couplers-2 hole, Bothe hole types, Illustrative Problems.

UNIT-III

MICROWAVE TUBES: Limitations and losses of conventional tubes at microwave frequencies. Microwave tubes-O type and M type classifications. O type tubes: 2 cavity klystrons-structure, Reentrant cavities, velocity modulation process and Applegate diagram, bunching process and small signal theory-Expressions for O/P power and efficiency. Reflex Klystrons-structure, Velocity Modulation, Applegate diagram, mathematical theory of bunching, power output, efficiency , oscillating modes and O/P characteristics, Effect of Repeller Voltage on Power O/P, Illustrative Problems.
MICROWAVE MEASUREMENTS:
Description of Microwave bench-different blocks and their features, errors and precautions, Measurement of attenuation, frequency standing wave measurements- measurement of low and high VSWR ,impedance measurements.

UNIT-IV

Introduction to Optical Fibers: Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations – Mode theory of Circular Wave guides-Overview of Modes-Key Modal concepts- Linearly Polarized Modes –Single Mode Fibers-Graded Index fiber structure.

UNIT-V

Signal Degradation Optical Fibers: Attenuation – Absorption losses, Scattering losses, Bending Losses,

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Core and Cladding losses, Signal Distortion in Optical Wave guides - Information Capacity determination – Group Delay- Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength

TEXT BOOKS:

1. Microwave devices and circuits-Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave principles-Herbert J.Reich,J.G.Skalnik, P.F.Ordung and H.L.Krauss, CBS publishers and distributors, New Delhi,2004.
3. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd ed., 2000.
4. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.

REFERENCES:

1. Foundations for microwave engineering-R.E.Collin, IEEE press, John Wiley, 2nd edition, 2002.
2. Microwave circuits and passive devices-M.L.Sisodia and G.S.Raghuvanshi,Wiley Eastern Ltd.,New age International publishers Ltd., 1995.
3. Max Ming-Kang Liu, "Principles and Applications of Optical Communications", TMH, 2010.
4. S.C.Gupta, "Text book on optical fiber communication and its applications", PHI, 2005.
5. Satish Kumar, "Fundamentals of Optical Fiber communications", PHI, 2009.

List of	PO no. and keyword	Competency	Performance
CO: 1	PO 4: Conduct investigations of complex problems	4.3	4.3.3
CO: 2	PO 2: Problem analysis:	2.4	2.4.1
CO: 3	PO 4: Conduct investigations of complex problems	4.1	4.1.2
CO: 4	PO 1: Engineering knowledge	1.3	1.3.1
CO: 5	PO 1: Engineering knowledge	1.3	1.3.1

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Course Code	Course Title	L	T	P	Credits
19APE0404	REAL TIME OPERATING SYSTEMS	3	0	0	3

Course Outcomes:

Upon successful completion of the course, students will be able to

CO1. Introduce real-time embedded systems

CO2. Describe the different types of policies.

CO3. Demonstrate the Multi-resource Services techniques.

CO4. Explain the Embedded System Components.

CO5. Explain the embedded system design based on avaiLaboratoryility and reliability.

UNIT-1: INTRODUCTION TO REAL-TIME EMBEDDED SYSTEMS

Brief history of Real Time Systems, A brief history of Embedded Systems. Resource Analysis, Real-Time Service Utility, Scheduling Classes, The Cyclic Executive, Scheduler Concepts, Preemptive Fixed Priority Scheduling Policies, Real-Time OS, Thread Safe Reentrant Functions.

UNIT II: RTOS POLICIES

Preemptive Fixed-Priority Policy, Feasibility, Rate Monotonic least upper bound, Necessary and Sufficient feasibility, Deadline – Monotonic Policy, Dynamic priority policies. I/O Resources: Worst-case Execution time, Intermediate I/O, Execution efficiency, I/O Architecture. Memory: Physical hierarchy, Capacity and allocation, Shared Memory, ECC Memory, Flash file systems.

UNIT III: MULTI-RESOURCE SERVICES

Blocking, Deadlock and livestock, Critical sections to protect shared resources, priority inversion. Soft Real-Time Services: Missed Deadlines, QoS, Alternatives to rate monotonic policy, mixed hard and soft real-time services.

UNIT IV: EMBEDDED SYSTEM COMPONENTS

Firmware components, RTOS system software mechanisms, Software application components. Debugging Components- Exceptions assert, checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self-test and diagnostics, External test equipment, Application-level debugging. Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations.

UNIT V: AVAILABORATORYILITY AND RELIABILITY DESIGN

Reliability and AvaiLaboratoryility, Similarities and differences, Reliability, Reliable software, AvaiLaboratoryle software, Design tradeoffs, Hierarchical applications for Fail-safe design. Design of RTOS – PIC microcontroller.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
CO2	PO 2: Problem analysis	2.3	2.3.2
CO3	PO 5: Modern tool usage	5.2	5.2.1
CO4	PO 3: Design/Development of solutions	3.2	3.2.2
CO5	PO 3: Design/Development of Solutions	3.2	3.2.2

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0406	MEMS	3	0	0	3

Course Outcomes:
CO1: Able to understand the Micro sensors and different material properties
CO2: Able to understand the micro machine process for different techniques
CO3: Able to understand the types of Microsensors
CO4: Able to understand the MEMS accelerometers functionality and know its applications.
CO5: Able to know where to use MEMS devices and understand CNT

UNIT I
Introduction: Introduction to MEMS & Microsystems, Introduction to Microsensors, Evaluation of MEMS, Microsensors, Market Survey, Application of MEMS, MEMS Materials, MEMS Materials Properties, MEMS Materials Properties.

UNIT II
Microelectronic Technology for MEMS: Microelectronic Technology for MEMS, Micromachining Technology for MEMS, Micromachining Process, Etch Stop Techniques and Microstructure, Surface and Quartz Micromachining, Fabrication of Micro machined Microstructure, Micro stereo lithography,

UNIT III
Micro Sensors: MEMS Microsensors, Thermal Microsensors, Mechanical Micromachined Microsensors, MEMS Pressure Sensor, MEMS Flow Sensor, Micro machined Flow Sensors, MEMS Inertial Sensors, MEMS Gyro Sensor

UNIT IV
MEMS Accelerometers: Micromachined Micro accelerometers for MEMS, MEMS Accelerometers for Avionics, Temperature Drift and Damping Analysis, Piezo resistive Accelerometer Technology, MEMS Capacitive Accelerometer, MEMS Capacitive Accelerometer Process, MEMS for Space Application.

UNIT V
MEMS Applications: Polymer MEMS & Carbon Nano Tubes CNT, Wafer Bonding & Packaging of MEMS, Interface Electronics for MEMS, Introduction to Bio MEMS and Micro Fluidics, Introduction to Bio Nano Technology, Bio Sensors, Fluidics, MEMS for Biomedical Applications (Bio-MEMS)

Text Books:
1. Nadim Maluf Kirt Williams "An Introduction to Micro electro mechanical Systems Engineering", Second Edition, Artech House, Inc. Boston London, International Standard Book Number: 1-58053-590-9.
2. Varadan, V KandVaradan "Microsensors, actuators, MEMS, and electronics for smart structures" Rai-Choudhury P (ed.) Handbook of Microlithography, Micromachining, and Micro fabrication, SPIE Optical Engineering Press

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 3: Design/Development of Solutions	3.4	3.4.1
CO: 2	PO 3: Design/Development of Solutions	3.4	3.4.1
CO: 3	PO 3: Design/Development of Solutions	3.4	3.4.1
CO: 4	PO 3: Design/Development of Solutions	3.4	3.4.1
CO: 5	PO 3: Design/Development of Solutions	3.4	3.4.1

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(AUTONOMOUS)-AK19 REGULATIONS

III B.Tech | **Semester-II** | **Branch : Common to all**

Subject Code	Subject Name	L T P	Credit: 3
19AHE9902	**Principles of Effective Public Speaking**	3 0 0	

Course Outcomes:

Students will be able to:

1. Apply knowledge of principles, concepts and skills learned in speech preparation.
2. Develop skills in effective listening.
3. Evaluate the delivery of speeches.
4. Develop skills in speech composition.
5. Use supporting materials and presentation aids in speech preparation.

Unit -1 Introduction to Public Speaking:

Basic communication concepts, processes, and models Communication concepts and principles and public speaking Steps and methods of speech preparation; Ethics in public speaking

Unit -2 Listening and Speech Criticism:

Effective listening, the listening process, and types of listening; Listening barriers; Identifying and improving listening styles; Evaluating speech and effective speech techniques.

Unit -3Selecting Topic and Knowing your Audience:

Identifying sources; Tools and techniques for selecting and refining speech topics; Identifying speech purposes; Central idea statement; The central idea; Audience analysis techniques.

Unit – 4 Speaking with a Purpose:

Informative, persuasive, and ceremonial speeches

Unit:5 Delivering your speech and using Visual Aids.

The mechanics of verbal and nonverbal communication in speech delivery; Modes of speech delivery; Speaking style and language; Effective delivery techniques; Incorporating presentation aids

References:

1. DeVito, J.A. (2009). The Essential Elements of Public Speaking. (3rd ed.) Boston: Pearson Education, Inc.

2. Lucas, S.E. (2009). The Art of Public Speaking. (10th ed.) New York: McGraw - Hill Co.

3. Zarefsky, D. (2011). Public Speaking: Strategies for Success. (6th ed. Boston: Pearson Education, Inc).

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.2
CO2	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1
CO3	PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings..	9.2	9.2.1
CO4	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.2
CO5	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

B.Tech III Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AOE0518	SCRIPTING LANGUAGES	3	0	0	3

Course Objectives:

1. To introduce client side scripting with JavaScript and HTML
2. To introduce server side programming with Java Servlets, JSP and PHP.
3. To learn the basic web concepts, protocols and frameworks for web development.

Course Outcomes:

1. Demonstrate knowledge on web page design elements, dynamic content and database Interaction,
2. Use HTML, JavaScript and PHP technologies for web application development
3. Design client-server applications using Scripting languages.
4. Able to do server side programming with Java Servlets, JSP and PHP.

UNIT I

Introduction: Fundamentals of HTML, Working with text, Organizing text in HTML, Working with links and URLS, Creating tables, Working with images, Canvas, Forms, Frames and Multimedia.

HTML5: Introduction, HTML5 Document Structure, Creating editable content, checking spelling mistakes, Exploring custom data attributes, Client-Side storage, Drag and drop feature, offline web application, Web communications, Cross-Document messaging and desktop notifications.

UNIT II

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,- Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript.

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies. Installing and Configuring Apache Tomcat Web Server: DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

UNIT III

Java Script Advanced concepts : Unicode, strings, symbols, control flow elements, exception handling, calLaboratoryle values, modules-ECMA script module, Dynamic module.

JSP Application Development: The Anatomy of a JSP Page, JSP Processing. JSP Application Design and JSP Environment, JSP Declarations, Directives, Expressions, Scripting Elements, implicit objects. Java Beans: Introduction to Beans, Deploying java Beans in a JSP page.

UNIT IV

Introduction to PHP: The problem with other Technologies (Servlets and JSP), Downloading, installing, configuring PHP, Programming in a Web environment and The anatomy of a PHP Page.

Overview of PHP Data types and Concepts: Variables and data types, Operators, Expressions and Statements, Strings, Arrays and Functions.

PHP Advanced Concepts: Using Cookies, Using HTTP Headers, Using Sessions, Authenticating users, Using Environment and Configuration variables, Working with Date and Time.

UNIT V

Creating and Using Forms: Understanding Common Form Issues, GET vs. POST, Validating form input, Working with multiple forms, and Preventing Multiple Submissions of a form.

PHP and MYSQL Integration : Interacting with my SQL using PHP,

Using PHP to Create – (i) Online Address book, (ii) Discussion forms, (iii) Online Store, (iv) Shopping cart, (v) Simple Calendar.

Text Books

1. Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Prentice Hall, 5 th Edition, 2011.
2. Sams Teach Yourself PHP & MySQL 5th Edition.
3. Java Script for Impatient Programmers by Dr.Axel Raushmayer.

Reference Books

1. Herbert Schildt, "Java-The Complete Reference", Eighth Edition, Mc Graw Hill Professional, 2011.
2. Core Servelets AND Java Server Pages VOLUME 1: CORE TECHNOLOGIES By Marty Hall and Larry Brown Pearson Snig Bahumik, Bootstrap Essentials, PACKT Publishing, 2015.
3. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens.
4. W. Jason Gilmore, Beginning PHP & MySql, APress, Fourth Edition, 2011.

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AK19 REGULATIONS
B. Tech III Year II Semester
Common to ECE & EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHE9907	**ADVANCED OPTICS**	3	0	0	Credits:3

Course Outcomes

1. Analyze the wave properties of light.
2. Interpret the interaction of energy with matter.
3. Analyze the semiconductor photo devices.
4. Interpret structural spectroscopic techniques.
5. Analyze NMR and ESR spectra.

UNIT I Polarization **10 Hours**

Polarization-Experimental observation-Polarization by reflection and refraction-Brewster angle-Pile of plates-Biot's polariscope- Malus laws, Double refraction - Optic axis, Uniaxial and biaxial crystals, Geometry of calcite crystals, Nicol prism, Nicol as analyzer and polarizer. Huygen's explanation of double refraction, Quarter wave and Half wave plates, Production and detection of plane, elliptical and circular polarization of light

UNIT II Semiconductor Optics **12 Hours**

Semiconductor light emitting diodes (LEDs)- Radiative and non-radiative recombination mechanisms in semiconductors-LED: device structure, materials and characteristics,- Review of laser physics-Rate equations for carrier- and photon-density, and their steady state solutions-Semiconductor laser: structure, materials, device characteristics, and figures of merit; DFB, DBR, and vertical-cavity surface-emitting lasers (VECSEL)- Tunable semiconductor lasers.

UNIT III Photo devices and their instrumentation **8 Hours**

Photodetectors -Types of semiconductor photodetectors -p-n junction, PIN, and Avalanche --- and their structure, materials, working principle and characteristics-Noise limits on performance- Solar cells. Low-dimensional optoelectronic devices -Quantum-well, -wire, and -dot based LEDs, lasers, and photodetectors.

UNIT IV Spectroscopic Techniques-I **9 Hours**

UV-visible Spectroscopy: principles- instrumentation- quantitative analysis by absorption measurements-simultaneous determinations- applications.

Raman Spectroscopy:Quantum theory of Raman effect –degree of depolarisation–FT Raman spectrometer-Instrumentation and sampling methods– construction of character table – calculation of normal modes of vibration - Raman and I.R activity.

UNIT V Spectroscopic Techniques-II **11 Hours**

NMR Spectroscopy : Theory of NMR method – Bloch equations- Steady state solution of Bloch equations-Theory of chemical shifts- Experimental methods –Single coil and double coil methods –Pulse method – High resolution method –Application of NMR to quantitative measurements. ESR Spectroscopy: Quantum mechanical treatment of ESR- hyperfine structure-Basic principles of spectrographs-Application of ESR method.

Textbooks:

1. Optics by Ajay Ghotak.
2. A textbook of Optics by Brij Lal and Dr. M. Subhramanyam.
3. Optics by Dr. S. P. Singh and Dr. A.P. Agarwal.

References:

1. Fundamental of Optics by F.A. Jenkins and H. E. White.
2. The Feynman Lecture of Physics by Richard Feynman.
3. Optics by Eugene Hecht.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO1 : Apply the knowledge of science	1.2	1.2.1
CO: 2	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 3	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 4	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 5	PO1: Apply the knowledge of science	1.2	1.2.1

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AK19 REGULATIONS
B. Tech III Year II Semester
Humanities Elective Course (ECE)

Subject Code	Subject Name	L	T	P	Credits
19AHE9905	MATERIALS CHEMISTRY	3	0	0	3

Course Outcomes

CO-1. Student should be able to understand the grain boundaries, properties, grain size measurement and types of solid solutions.
CO-2. Student should be able to understand in detail about one component and binary component system.
CO-3. Ability to know about composite materials, preparation of metal powders.
CO-4. Ability to understand Chemical analysis and different types of spectroscopic techniques.
CO-5. Student should be able to understand in detail about material structure, crystal defects and constitution of alloys.

Unit- I: Introduction To Materials Science

Structure of metals: Bonds in Solids, Crystallization of metals, Grain and grain boundaries, Effect of grains and boundaries on the properties of metals / alloys, Determination of grain size measurement.
Constitution of alloys: Necessity of alloying, Types of solid solutions, Humerothery rules, Intermediate alloy phases.

Unit II: Multiphase Materials

Introduction to interstitial and substitutional solid solutions, complex solid solutions intermetallic compounds, condensed phase rule, one component system Si and Fe. Binary isomorphous system: Cu-Ni, Au-Cu,Liver Rule, Fe-Ni, Fe-C phase diagrams, phase transformation in Fe-C alloys, Ferrous and non-ferrous alloys.

Unit – III: Powder Metallurgy and Composite Materials

Methods of production of metal powders, Atomization process, Electrolysis, Reduction, Mechanical Alloying, Mixing, Blending, Compacting, Hot and Cold Isostatic pressing, Sintering, Applications, Advantages and limitations of powder metallurgy; Composite materials – types of matrices and reinforcement, polymer matrix composites, metal matrix composites.

Unit – IV: Characterization of Materials

Introduction, Steps in metallographic specimen preparation, Optical Microscopy, Elements of Image Analysis and Quantitative Metallography, X-Ray Diffraction, Intensity of diffracted beam, Scanning Electron Microscopy, Modes of Operation, Fractography, Chemical Analysis using Energy Dispersive Analysis – Transmission Electron Microscopy Principles.

Unit V: Crystal structures and imperfections in crystals

Materials Structure: Space lattice, Unit cells and Metallic crystal structures (SC, BCC, FCC and HCP), Crystal defects: Point, Line, Interstitial and Volume, Primary and secondary bonding in materials. Constitution of Alloys: Necessity of Alloying, Gibb's phase.

References:

1. Callister W.D., "Material Science and Engineering- An Introduction", 9th Edition, Wiley Eastern, 2013.
2. V.D. Kodgire and S.V. Kodgire, "Material Science and Metallurgy for Engineers", 41st Edition, Everest Publishing House, 2017.
3. George E. Dieter, "Mechanical Metallurgy", McGraw Hill, 1988
4. V. Raghavan, "Materials Science and Engineering", 5th Edition, PHI, 2005.
5. Matthew J. Donachie, "Super Alloys: A Technical Guide", 2nd Edition, 2002.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 2	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 3	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 4	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 5	PO 1: Apply the knowledge of basic science	1.2	1.2.1

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(AUTONOMOUS)-AK19 REGULATIONS
B. Tech III Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0422	MICROWAVE ENGINEERING AND OPTICAL COMMUNICATIONS LABORATORYORATORY	0	0	2	1

Course Outcomes:

CO1: Capable of Applying microwave Concepts/ Microwave components and test them .
CO2: Able to analyze Microwave Active Devices by conducting experiments and measuring various parameters.
CO3: Able to analyze antenna performance by conducting experiments and measuring various parameters.
CO4: Able to design and analyse an optical fiber communications link.
CO5: Able to analyze the characteristics of Optical Sources and Optical fiber by conducting experiments and measuring various parameters.

Microwave Laboratory (PART – A) --- Any Six (6) Experiments

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Frequency and Wavelength measurements using slotted section.
7. Radiation Pattern Measurement of any two Antennas.

Optical Fiber Laboratory (PART – B) --- Any four (4) Experiments

1. Characterization of LED.
2. Characterization of Laser Diode.
3. Measurement of Numerical Aperture of the given fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of losses for Analog Optical link.

Equipment required for Laboratoryoratories:

1. Regulated Klystron Power Supply 6 nos.
2. VSWR Meter 6 nos.
3. Milli/Micro Ammeters 10 nos.
4. Multi meters 10 nos.
5. CROs 8 nos.
6. GUNN Power Supply, Pin Moderator4 nos.
7. Relevant Microwave components --
8. Fiber Optic Analog Trainer based LED3 nos.
9. Fiber Optic Analog Trainer based laser2nos.
10. Fiber Optic Digital Trainer 1 no.
11. Fiber cables - (Plastic, Glass)

List of	PO no. and keyword	Competency	Performance
CO: 1	PO 4: Conduct investigations of complex problems	4.3	4.3.1
CO: 2	PO 4: Conduct investigations of complex problems	4.1	4.1.2
CO: 3	PO 4: Conduct investigations of complex problems	4.3	4.3.3
CO: 4	PO 4: Conduct investigations of complex problems	4.2	4.2.1
CO: 5	PO 4: Conduct investigations of complex problems	4.3	4.3.3

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B. Tech IV Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0510	COMPUTER NETWORKS	3	0	0	3

Course Outcomes: Student will be able to

CO: 1 Understand the basics of data communications and networking
CO: 2 Classify the functionalities of two sub layers of Data link Layer
CO: 3 Know briefly about Network Layer through algorithms and protocols
CO: 4 Distinguish the services provided by Transport Layer.
CO: 5 Recognize the services offered by Application Layer to the user

Unit I

Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration.

Network Models: Protocol Layering, TCP/IP Protocol Suite, The OSI Model

Introduction to Physical Layer: Data and Signals, Transmission Impairment, Data Rate Limits, Performance.

Transmission Media: Introduction, Guided Media, Unguided Media, Switching: Introduction, Circuit Switched Networks, Packet Switching

Unit II

The Data Link Layer: Introduction, Link layer addressing, Error detection and Correction: Cyclic codes, Checksum, Forward error correction, Data link control: DLC Services, Data link layer protocols, HDLC, Point to Point Protocol.

Media Access control: Random Access, Controlled Access, Channelization, Connecting devices and virtual LANs: Connecting Devices.

Unit III

The Network Layer: Network layer design issues, Routing algorithms, Congestion control algorithms, Quality of service, Internetworking.

The network layer in the Internet: IPV4 Addresses, IPV6, Internet Control protocol, OSPF, BGP, IP, ICMPv4, IGMP.

Unit IV

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP, Performance problems in computer networks, Network performance measurement.

Unit V

The Application Layer: Introduction, Client-Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP.

Text Books:

1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson, 5th edition, 2010.

References:

1. Data Communication and Networks, Bhushan Trivedi, Oxford
2. "Internetworking with TCP/IP – Principles, protocols, and architecture - Volume 1, Douglas E. Comer, 5th edition, PHI
3. "Computer Networks", 5E, Peterson, Davie, Elsevier.

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4. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.
5. "Computer Networks and Internets with Internet Applications", Comer.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1. Engineering knowledge	1.3	1.3.1
CO2	PO2. Problem Analysis	2.2	2.2.2
CO3	PO1. Engineering knowledge	1.3	1.3.1
CO4	PO1. Engineering knowledge	1.4	1.4.1
CO5	PO2. Problem Analysis	2.1	2.1.1

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B.Tech IV Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AOE0301	MANAGEMENT SCIENCE	3	0	0	3

Course Outcomes:

CO: 1 Understand the concepts & principles of management and designs of organization in a practical world.

CO: 2 Apply the knowledge of Work-study principles & Quality Control techniques in industry.

CO: 3 Analyze the concepts of HRM in Recruitment, Selection and Training & Development.

CO: 4 Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.

CO: 5 Create Modern technology in management science

UNIT I

Introduction to Management:

Management - Concept - Nature - Functions – Levels - Evolution of Management Thought - Taylor's Scientific Theory - Henry Fayol's principles - Elton Mayo's Human relations - Leadership styles - Autocratic leadership - Democratic & Free rein leadership.

Organizational Designs: Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization.

UNIT II

Operations Management:

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study. **Material Management** - Objectives – Inventory classification - Inventory Techniques - EOQ-ABC Analysis

Marketing Management: Concept - Meaning - Nature- Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

UNIT III

Human Resources Management (HRM):

HRM - Definition and Meaning - Managerial and Operative functions - Evolution of HRM - Job Analysis & Job Evaluation - Human Resource Planning (HRP) Process/Procedure- Employee Recruitment Process - Employee Selection Process and Tests in Employee Selection - Employee Training and Development - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

UNIT IV

Strategic Management:

Definition & Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - SWOT Analysis

Project Management - Network Analysis - Programme Evaluation 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).

UNIT V

Contemporary 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.

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Textbooks:

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", 6th edition, TMH, 2005.
2. Thomas N.Duening & John M.Ivancevich, "Management Principles and Guidelines", Biztantra.
3. Kanishka Bedi, "Production and Operations Management", Oxford University Press, 2004.

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO 1: Engineering knowledge	1.4	1.4.1
CO 2	PO 2: Problem analysis	2.1	2.1.3
CO 3	PO 4: Conduct investigations of complex problems	4.1	4.1.2
CO 4	PO 2: Problem analysis	2.1	2.1.2
CO 5	PO 1: Engineering knowledge	1.4	1.4.1

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B. Tech IV Year I Semester

Course Code	Course Title	L	T	P	Credits
19APE0409	RF SYSTEM DESIGN	3	0	0	3

Course Outcomes:
By the end of this course, the student will be able to
CO-1: Understand working of Series/Parallel RLC networks & Transmission lines at Radio frequencies.
CO-2: Analyze MOS devices in RF amplifier circuits and different types of noise effect on RF devices.
CO-3: Compare different noise parameters and mixers.
CO-4: Design different RF power amplifier circuits for high frequency application.
CO-5: Illustrate fundamental techniques in cellular mobile communication systems

UNIT – I
Introduction RF systems – basic architectures, Transmission media and reflections, Maximum power transfer, Passive RLC Networks, Parallel RLC tank, Series RLC networks, matching, Pi match, T match, Passive IC Components Interconnects and skin effect, Resistors, capacitors Inductors.

UNIT – II
Review of MOS Device Physics – MOS device review, Distributed Systems, Transmission lines, reflection coefficient, the wave equation, examples, Lossy transmission lines, High Frequency Amplifier Design, Bandwidth estimation using open-circuit time constants, Bandwidth estimation, using short-circuit time constants, Shunt-series amplifiers, tuned amplifiers, Cascaded amplifiers

UNIT – III
Noise – Thermal noise, flicker noise, Noise figure, LNA Design, Intrinsic MOS noise parameters, Power match versus, noise match, large signal performance, Multiplier based mixers. Mixer Design, Subsampling mixers.

UNIT – IV
RF Power Amplifiers, Class A, AB, B, C amplifiers, Class D, E, F amplifiers, RF Power amplifier design examples, Voltage controlled oscillators, Resonators, Phase locked loops, Linearized PLL models, Phase detectors, charge pumps, Loop filters, and PLL design examples.

UNIT - V
Introduction to Cellular Mobile system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems. Radio architectures, GSM radio architectures, CDMA, UMTS radio architectures.

TEXT BOOKS:

1. The design of CMOS Radio frequency integrated circuits by Thomas H. Lee Cambridge university press, 2004.
2. RF Micro Electronics by Behzad Razavi, Prentice Hall, 1997.
3. Mobile cellular telecommunications-W .C. Y. Lee, Tata Mc-Graw Hill, 2nd Edition,
4. 2006.

REFERENCES:

1. Matthew M. Radmanesh," Radio frequency and Microwave Electronics illustrated", Pearson Education Inc, Delhi, 2006.
2. B. Razavi, "RF Microelectronics", Pearson Education, 1997.
3. Devendra. K. Misra," Radio Frequency and Microwave communication Circuits – Analysis and Design", John Wiley and Sons, Newyork,2004.
4. B. Razavi, "Design of Analog COMS Integrated Circuits", Mc Graw Hill, 2001.
5. Wireless communications-Theodore. S. Rapport, Pearson Education,2ndEdn.,2002.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering Knowledge	1.3	1.3.1
CO: 2	PO 3: Design/Development of Solutions	3.1	3.1.1
CO: 3	PO 1: Engineering Knowledge	1.3	1.3.1
CO: 4	PO 3: Design/Development of Solutions	3.1	3.1.1
CO: 5	PO 1: Engineering Knowledge	1.4	1.4.1

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: TIRUPATI
(AUTONOMOUS)
B. Tech IV Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0412	DIGITAL IC DESIGN	3	0	0	3

Course Outcomes:

Upon completion of the course student should be able to

CO1: Understand the Design concepts of CMOS inverters with specified noise margins and propagation.
CO2: Verify the Analysis of Complex CMOS logic circuits.
CO3: Realize and implement basic sequential elements that are commonly observed in digital ICs.
CO4: Analyze the dynamic characteristics of CMOS circuits
CO5: Implement CMOS Digital IC concepts for usage of modern CAD tools and their Limitations.

UNIT-I

MOS Design Pseudo NMOS Logic:

Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT – II

Combinational MOS Logic Circuits:

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT – III

Sequential MOS Logic Circuits:

Behaviour of Bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT – IV

Dynamic Logic Circuits:

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT - V

Semiconductor Memories:

Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory-NOR flash and NAND flash

TEXTBOOKS:

1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
3. Neil H. E. Weste, David Money Harris,"CMOS VLSI Design-A Circuit and Systems Perspective", Pearson 4th Edition,2011.

REFERENCES:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.
3. John P.Uyemura, "Introduction to VLSI Circuits and Systems", Wiley Edition, 2002.
4. Eugene D Fabricus, "Introduction to VLSI Design, "McGraw Hill International Edition, 1990.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	**PO 1:** Engineering knowledge	1.4	1.4.1
CO: 2	**PO 4:** Conduct Investigations of complex problems	4.2, 4.3	4.2.1, 4.3.4
CO: 3	**PO 3:** Design/Development of Solutions	3.2	3.2.2
CO: 4	**PO 3:** Design/Development of Solutions	3.4	3.4.1,3.4.2
CO: 5	**PO 2:** Problem analysis **PO 5:** Modern tool usage	2.2 5.2	2.2.2, 2.2.3 5.2.1

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(AUTONOMOUS)
B. Tech IV Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0410	SATELLITE COMMUNICATION	3	0	0	3

Course Outcomes:
By the end of this course, the student will be able to
CO1: Understand the architecture of satellite system.
CO2: Analyze various aspects related to satellite systems.
CO3: Analyze the effects on Satellite communication.
CO4: Design of satellite link for specified parameters.
CO5: Apply various modulation and multiple access schemes in Satellite Communication.

Unit -I
INTRODUCTION TO SATELLITE COMMUNICATION: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication. Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.

Unit -II
SATELLITE SUB-SYSTEMS: Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.

Unit III
EFFECTS ON SATELLITE COMMUNICATION: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.

Unit -IV
SATELLITE LINK DESIGN: Basic transmission theory, system noise temperature and G/T ratio, design of down links, uplink design, design of satellite links for specified C/N, system design example

Unit-V
MODULATION AND MULTIPLE ACCESS SCHEMES: Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.

Text /Reference Books:

1. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India. 2nd edition 2002.
2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009. 3. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill, 2009

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 2: Problem analysis	2.3	2.3.2
	PO 3: Design/Development of solutions	3.2	3.2.2
CO2	PO 3: Design/Development of solutions	3.2	3.2.2
CO3	PO 3: Design/Development of solutions	3.2	3.2.2
CO4	PO 3: Design/Development of solutions	3.2	3.2.2
CO5	PO 3: Design/Development of Solutions	3.2	3.2.2

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B. Tech IV Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AOE0304	ROBOTICS	3	0	0	3

Course Outcomes:

CO: 1 The fundamental concepts of various configurations of the robot manipulators and their working principlesused in the industries

CO: 2 The basics of motion analysis of manipulator and process to find forward kinematics and inverse kinematicsof the robot manipulator

CO: 3 The path planning of a robot manipulator for given polynomial equation and how to avoid obstacles in its path

CO: 4 The performance of various feedback components like sensors.

CO: 5 The performance of actuators and how they can be usedaccording to the specifications of the manipulator

UNIT I

INTRODUCTION AND COMPONENTS OF THE INDUSTRIAL ROBOTICS

Introduction: **Automation** and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT II

MOTION ANALYSIS:

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulation.

UNIT III

TRAJECTORY PLANNING (09)

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion – straight line motion.

UNIT IV

ROBOT ACTUATORS AND FEEDBACK COMPONENTS (09)

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors.

UNIT V

ROBOT APPLICATION IN MANUFACTURING (09)

Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Text Books:

1. Groover M P, "Industrial Robotics", Mc Graw Hill.
2. Ramachandran Nagarajan, "Introduction to Industrial Robotics", Pearson.

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Reference Books:

1. Spony, Vidyasagar, "Robot Dynamics and Controls", John Wiley,
2. Asada, Slotine, "Robot Analysis and control", Wiley Inter-Science

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO 1: Engineering knowledge	1.4	1.4.1
CO 2	PO 2: Problem analysis	2.1	2.1.3
CO 3	PO 4: Conduct investigations of complex problems	4.1	4.1.2
CO 4	PO 2: Problem analysis	2.1	2.1.2
CO 5	PO 1: Engineering knowledge	1.4	1.4.1

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AK19 Regulations
B. Tech IV Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHE9901	Technical Writing	2	0	0	2

Course Outcomes:
Students will be able to:

1. Participate actively in writing activities (individually and in collaboration) that model effective scientific and technical communication in the workplace.
2. Understand how to apply technical information and knowledge in practical documents for a variety of a professional audiences (including peers and colleagues or management) and public audiences.
3. Practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing, using direct order organization, objectivity, unbiased analyzing, summarizing, coherence and transitional devices.
4. Apply grammatical structures to formulate sentences.
5. Design the main features of the brochure, content architectural design, filters etc.

Syllabus

Unit -1

An Introduction to Technical Writing

Technical writing vs. General writing b. Purpose, importance and characteristics of technical writing, Objectives of technical writing: Clarity, conciseness, accuracy, organization, ethics, Audience recognition and involvement: High tech audience, low-tech. audience, gender neutral language

Unit -2

Memorandum

Objectives, difference between memos, letters and emails. Criteria and format for writing and memos, minutes & agenda

Unit -3

Letter Writing

Business letters- (Greetings, salutations, order, complaint, inquiry), Job-applications (Covering letters) Resume writing.

Unit – 4

Report Writing

Characteristics, types and writing of various reports: feasibility reports, inventory report, mishap report, progress report, laboratory report, Project report, clusters & link words.

Unit - 5

Graphic representation of Technical Data, SOP writing, Promotional Writings

Technical Brochure designing ,Content writing for Websites (For promotional and troubleshooting purposes), Writing Fliers and Newsletters

References:

1. Sharon J. Gerson and Steven M. Gerson, Technical writing – process and product ,Pearson Education Asia
2. Andrea J. Ratherford ,Basic Communication Skills for Technology, Pearson Education Asia
3. Pfeiffer, W.S. and T.V.S. Padmaja. Technical Communication. Pearson.
4. Muralikrishna and Sunita Mishra. Communication Skills for Engineers. Pearson
5. CharlesW.Knisely and KarinI.Knisely.Engineering Communication. Cengage

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List of Cos	PO no. and keyword
CO 1	PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
CO 2	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
CO 3	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
CO4	PO10- Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
CO5	PO10- Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

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B. Tech IV Year I Semester
Humanities Elective

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHE9906	Effective Technical Communication	2	0	0	2

Course Outcomes

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

1. Understand the importance of effective technical communication
2. Analyze non-verbal language suitable to different situations in professional life
3. Evaluate different kinds of methods used for effective presentations
4. Create trust among people and develop employability skills
5. Develop skills in speech composition.

Syllabus

Unit 1: Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

Unit 2: Technical Writing, Grammar and Editing: Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style.

Unit 3: Self Development and Assessment: Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, taking notes; Complex problem solving; Creativity.

Unit 4: Technical Writing: Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

Unit 5: Speaking with a purpose: Public speaking, Group discussion, Oral presentation, Interviews, Graphic presentation, Presentation aids, Personality Development.

TEXT BOOKS/REFERENCES:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004.
2. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, 2019.
3. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843).
4. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
5. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
6. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)

List of COs	PO.No. and Key word
CO1	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
CO2	PO12 : Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
CO3	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
CO4	PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
CO5	PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0427	EMBEDDED SYSTEMS AND UAV LABORATORY	0	0	2	1

Course Outcomes:
Upon completion of the course student can be able to
CO1: Understand the concepts of TM4C123GH6PM microcontroller
CO2: Perform the Program using TM4C123GH6PM for various tasks.
CO3: Design and implement some specific real time applications Using TM4C123GH6PM microcontroller
CO4: Assemble quadcopter, hexacopter and RC Electric Glider Aircraft.
CO5: Operate quadcopter, hexacopter and RC Electric Glider Aircraft.

List of Experiments

(Minimum of Ten Experiments has to be performed 5 Experiments from PART A and 5 from PART-B)

PART-A

1. Write a C program for configuration of GPIO ports for Input and output operation (blinking LEDs, push buttons interface).
2. Write a C program for EK-TM4C123GXL Launchpad and associated Timer ISR to toggle onboard LED using interrupt programming technique.
3. Configure hibernation module of the TM4C123GH6PM microcontroller to place the device in low power state and then to wake up the device on RTC (Real- Time Clock) interrupt.
4. Configure in-build ADC of TM4C123GH6PM microcontroller and interface potentiometer with EK-TM4C123GXL Launchpad to observe corresponding 12- bit digital value.
5. Learn and understand the generation of Pulse Width Module (PWM) signal by configuring and programming the in-build PWM module of TM4C123GH6PM microcontroller.
6. Learn and understand the generation of Pulse Width Module (PWM) signal by configuring and programming the in-build PWM module of TM4C123GH6PM microcontroller.
7. Learn and understand interfacing of accelerometer in Sensor Hub Booster pack with EK-TM4C123GXL Launch pad using I2C.

PART-B

1. Study of UAV subsystems, sensors and their main characteristics.
2. Assemble Quadcopter Drone with GPS.
3. Assemble Hexacopter Drone with GPS.
4. Take a snapshot using Quad copter Drone with Camera.
5. Takeoff and land Quadcopter and Hexacopter drones.
6. Fly RC Electric Glider Aircraft.
7. Attach 5 Liter sprayer tank and fly Quadcopter Drone.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	**PO 1:** Engineering knowledge	1.4	1.4.1
CO: 2	**PO 4:** Conduct Investigations of complex problems	4.2, 4.3	4.2.1, 4.3.4
CO: 3	**PO 3:** Design/Development of Solutions	3.2	3.2.2
CO: 4	**PO 3:** Design/Development of Solutions	3.4	3.4.1,3.4.2
CO: 5	**PO 2:** Problem analysis **PO 5:** Modern tool usage	2.2 5.2	2.2.2, 2.2.3 5.2.1

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ELECTRONIC SYSTEMS FOR CANCER DIAGNOSIS

PROF. HARDIK JEETENDRA PANDYA
Department of Electronic Systems Engineering
IISc Bangalore

PRE-REQUISITES : Basic Electronics/Microfabrication

INTENDED AUDIENCE : Engineering Students, Faculty from Engineering Colleges

COURSE OUTLINE :

This course is designed with an aim of educating students on the process flow for designing electronic systems for tissue-based cancer diagnosis. An exposure towards developing strategies to discriminate pathological cells from normal ones based on the electrophysiological properties of cells. Design and integrate biochip with electronic module for understanding the electro-thermo-mechanical properties of tissues. microtechnology and its use to fabricate sensors and systems. Students will have an exposure towards how to fabricate the sensors and its application in real world. Several examples of engineering devices used in clinical research will be also covered. Both conventional (class 1000) and non-conventional (class 10000) clean room and some equipment within it will also be shown. Below are some of the course outcomes.The first objective of this course is to understand cancer and its properties: Breast Cancer and Oral CancerThe second objective is to educate the students on the process flow for designing electronic systems for tissue-based cancer diagnosisThe third objective is to develop skills to design electronic systems for cytology-based studiesFourth objective is to develop skills to integrate biochips with electronic system for cancer diagnosisThe fifth objective is to understand how to work in a conventional (class 1000) and non-conventional (class 10000) clean room environment and understand several equipmentsThe final objective is to learn and understand in detail how to design electronic systems with the preexisting knowledge of basic electronics and to add on the 3D printing skills.

ABOUT INSTRUCTOR :

Prof. Hardik J. Pandya is an assistant professor in the Department of Electronic Systems Engineering, Division of Electrical Sciences, IISc Bangalore where he is developing Advanced Microsystems and Biomedical Devices Facility for Clinical Research and Biomedical and Electronic (10-6-10-9) Engineering Systems Laboratory to carry out cutting-edge research on novel devices to solve unmet problems in biology and medicine. He is recipient of prestigious Early Career Research Award from Science and Engineering Research Board, Government of India as well as a start-up grant of 228 Lacs from IISc. He has taught Design for Analog Circuits, Analog Integrated Circuits, VLSI technology, and Semiconductor Devices to undergraduate and graduate students from Electronic Engineering, Instrumentation Engineering, and Applied Physics. He seek to understand and exploit novel ways of fabricating microengineering devices using glass, silicon, polymers and integrate with unusual classes of micro/nanomaterials. His research interests include integrating biology/medicine with micro- and nanotechnology to develop innovative tools to solve unmet clinical problems.

COURSE PLAN :

Week 1 : Introduction to tissue related cancers (Focusing on Breast Cancer and Oral Cancer)Current Gold Standards

Week 2 : Understanding the change in cells or tissue morphology.Developing strategies for diagnosis based on Morphology changes.

Week 3 : Basics of tissue culture methods: Types of cell growth, Work area and equipment (Laminar flow hoods, CO_2 incubators, Microscopes, Preservation, Vessels, Storage)

Week 4 : Maintaining cells (harvesting, media and growth requirements), Safety considerations, Cell counting

Week 5 : Understanding 3D Printing and its use as packaging and press-fit contacts in electronic systems for cancer diagnosis

Week 6 : Hands-on experience in designing a 3D printed casing for electronic system packaging

Week 7 : Process for designing electronic system for early diagnosis of cancer based on tissue images

Week 8 : Process for designing electronic systems for cytology studies (cell extraction, scanning and image capturing).

Week 9 : Electronic Systems integrated with Biochip for understanding change in electro-thermo-mechanical properties of tissue

Week 10 : Working in a Clean Room (non-conventional Class 10000) and inspection of Cancer Diagnosis Tool with a basic training of operating the tools

Week 11 : Hands-on experience on lithography

Week 12 : Hands-on experience on wet-bench

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Year: II B.Tech **Semester: I** **Branch: Common to All**

Subject Code 19AES0510	Subject Name Basics of Python Programming Laboratory	L T P 0 0 2	Credits 1

Course Objectives:

To train the students in solving computational problems
To elucidate solving mathematical problems using Python programming language
To understand the fundamentals of Python programming concepts and its applications To understand the object-oriented concepts using Python in problem solving.

Laboratoryoratory Experiments

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

```
+ - - - - + - - -
      - +
  ||          |
  ||          |
  ||          |
  ||          |
+ - - - - + - - -
      - +
  ||          |
  ||          |
  ||          |
  ||          |
+ - - - - + - - -
      - +
```

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

```
#                    #       #
#                  # # # #
#  #               # # # # #
```

Up to 15 hashes at the bottom

4. Using turtles concept draw a wheel of yourchoice
5. Write a program that draws ArchimedeanSpiral
6. The letters of the alphabet can be constructed from a moderate number of basic elements, 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 thealphabet.
7. 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 January1970.

```
>>> import time
>>>time.time() 1437746094.5735
958
```

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.

8. Given n+r+1 <= 2r . n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies theabove.
9. Write a program that evaluates Ackermannfunction
10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a

numerical approximation of 1/ π:

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.

11. 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-infunctions.

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

13. 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 ornegative.

14. Given rows of text, write it in the form ofcolumns.

15. Given a page of text. Count the number of occurrences of each latter (Assume case insensitivity and don"t consider special characters). Draw a histogram to represent thesame

16. Write program which performs the following operations on list"s. Don"t use built-infunctions

a) Updating elements of alist
b) Concatenation oflist"s
c) Check for member in thelist
d) Insert into thelist
e) Sum the elements of thelist
f) Push and pop element oflist
g) Sorting oflist
h) Finding biggest and smallest elements in thelist
i) Finding common elements in thelist

17. Write a program to count the number of vowels in aword.

18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them tolowercase.

19. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of- copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in differenteras.

20. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of- copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from thefile.

21. 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 samecontents.

22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.

23. Write a program illustrating the object oriented features supported byPython.

24. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class andfailed.

25. 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 yearrules.

26. 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)

Laboratory Outcomes:

Student should be able to

Design solutions to mathematicalproblems. Organize the data for solving theproblem.

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- ☐
- ☐

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Develop Python programs for numerical and text basedproblems. Select appropriate programming construct for solving theproblem. Illustrate object orientedconcepts.

Reference Books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python 3", 3rdedition, AvaiLaboratoryle 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

COs	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 5: Modern tool usage	5.1	5.1.1
CO2	PO 5: Modern tool usage	5.2	5.2.1
CO3	PO 4: Conduct investigations of complex problems	4.3	4.3.1
CO4	PO 3: Design/Development of solutions	3.4	3.4.1
CO5	PO 6: The engineer and society	6.1	6.1.1

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(Autonomous) AK19 Regulations

Year:II **Semester:II** **Branch of Study : Common toall**

Course Code	Course Title	L	T	P	Credits
19AES0303	Design Thinking and Product Innovation Laboratory	0	0	2	1

Course Outcomes:

CO 1: Design and Fabricate using PCB
CO 2: Design Analog and Digital Circuits using PCBs and ICs.
CO 3: Design measuring devices for temperature, pressure, humidity, water level, smart lighting.
CO4: Design and simulate various filters for Image processing using MATLABORATORY
CO 5: Design and Implement Interfacing of Various devices to 8086/8051

List of Experiments (Minimum of 10 experiments)

1. PCB Design and Fabrication
2. Design an Analog circuit using PCB
3. Design a Digital circuit using ICs
4. Design a device for measurement of Temperature/ pressure.
5. Design a device for measurement of Humidity.
6. Design a device for Water Level Indicator.
7. Design a Smart Lighting system.
8. Design and simulate a filter for removing noise in image using Mat Laboratory
9. Design and simulate a filter for Enhance contrast in image using Mat Laboratory
10. Design and Implement Interfacing of 8279 Keyboard / Display Controller with 8086/8051
11. Design and Implement Interfacing of 8255 PPI with 8086/8051
12. Design and Implement Interfacing of 8259 Interrupt Controller with 8086/8051

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	**PO 1:** Engineering knowledge	1.3	1.3.1
CO: 2	**PO 2:** Problem analysis	2.1	2.1.2
CO: 3	**PO 5:** Modern tool usage	5.3	5.3.2
CO: 4	**PO 4:** Conduct investigations of complex problems	4.1	4.1.2 4.1.3
CO: 5	**PO 3:** Design/Development of Solutions	3.4	3.4.2

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Year: II **Semester:II** **Branch of Study: ECE**

Course Code	Course Title	L	T	P	Credits
19APC0406	Analog Electronic Circuits	3	0	0	3

Course Objectives: Students will be able to
CO1: Understand multi stage amplifiers using BJT and FET.
CO2: Understand high frequency model and analyze its frequency responses. CO3: Understand feedback amplifiers and oscillators along with design.
CO4: Understand power amplifiers.
CO5: Understand tuned amplifiers and their effect on bandwidth and stability.

Unit I: Multi Stage Amplifiers
Introduction, Classification of Amplifiers, Analysis of Cascaded amplifiers, Different Coupling Schemes used in Amplifiers, Analysis of two stage RC Coupled Amplifier, high input resistance transistor amplifiers- Darlington Pair Amplifier, Boot Strap Emitter Follower, Cascade Amplifier, Differential Amplifier, Analysis of multi stage amplifiers using FET.

Unit II: High Frequency Transistor Amplifiers- BJT
Transistor at High Frequencies, Hybrid- π Common Emitter transistor model, Validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters, Single Stage CE Amplifier frequency response with short circuit load and resistive load, gain cutoff frequencies, Gain-Bandwidth Product, Emitter follower at higher frequencies, Illustrative design problems.
FET:FET at High Frequencies, High Frequencies FET Model, Analysis of Common Source and Common Drain Amplifier circuits at High frequencies.

Unit III: Feedback Amplifiers and Oscillators
Conceptsof Feedback, Classification of Feedback Amplifiers, General Characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier characteristics: Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative design Problems.
Introduction, Classification of Oscillators, Conditions for Oscillations, RC and LC Oscillators, RC-Phase shift and Wien-Bridge Oscillators, Generalized Analysis of LC Oscillators, Hartley and Colpitts Oscillators, Crystal Oscillators, Frequency and Amplitude Stability of Oscillators, Illustrative design problems.

Unit IV: Power Amplifiers
Introduction, Classification of power amplifiers, Class A large signal Amplifiers-Series fed and Transformer coupled amplifier, Efficiency, Class B Amplifier -Push-pull amplifiers, Efficiency of Class B Amplifier, Complementary Symmetry push pull amplifier, Cross over Distortion, Phase Inverters, Class AB operation, Class D amplifier, Class S amplifier, MOSFET power amplifier, Thermal stability and Heat sink, Second harmonic Distortions, Higher order harmonic Distortion.

Unit V: Tuned Amplifiers
Introduction, series resonance, Transformation of resistor and inductor ,Parallel Resonance, Q-Factor, Impedance variation near resonance,Classification of tuned amplifiers, Small Signal Tuned Amplifier – Capacitance and transformed coupled single tuned amplifier, Double Tuned Amplifiers, Effect of Cascading Single tuned amplifiers on Band width, Effect of Cascading Double tuned amplifiers on Band width, Staggered tuned amplifiers, Stability of tuned amplifiers

Text Books:

1. J. Millman and C.C. Halkias, "Integrated Electronics", McGraw-Hill, 1972.
2. Donald A. Neaman, "Electronic Circuit Analysis and Design", McGraw Hill.
3. Salivahanan, N.Suressh Kumar, A. Vallavaraj, "Electronic Devices and Circuits", Tata McGraw Hill, Second Edition.

References:

1. Robert T. Paynter, "Introductory Electronic Devices and Circuits", Pearson Education, 7th Edition
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory"

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Pearson/Prentice Hall, 9th Edition, 2006.
3. Sedra A.S. and K.C. Smith, "Micro Electronic Circuits", Oxford University Press, 5th Edition.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO3	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO4	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1

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Year: II **Semester: II** **Branch of Study: ECE**

Course Code	Course Title	L	T	P	Credits
19APC0208	Control Systems	3	0	0	3

Course Outcomes: Students will be able to

CO1: Develop the transfer function of Mechanical systems, Electrical systems and Electro mechanical systems.
CO2: Develop the transfer function using Block Diagram reduction and Signal flow graph technique of LTI systems.
CO3: Obtain the time domain specifications and error constants of a First order and second order systems.
CO4: Determine the stability of a linear time invariant systems using Routh criterion, Root locus, Bode plots, polar plots and Nyquist plot.
CO5: Derive state space model of a given physical system and solve the state equation.

Unit-I: Introduction to Control Problem

System Representation-Classification of systems-Feedback Control-Benefits of Feedback- Open-Loop and Closed-loop systems. Advantages and Dis-advantages of control systems-Industrial Control examples – Transfer functions and limitations. Mathematical models of Physical systems-Transfer function models of linear time-invariant systems- Electrical, Mechanical and Electro-Mechanical Systems-Electrical Analogues-Block diagram and their Reduction techniques-Signal flow graph.

Unit-II: Time Response and Stability Analysis

Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response-Steady state error -Static and generalized error constants.

Unit-III: Stability Analysis

Concept of stability–Absolute and Relative Stability analysis-Routh-Hurwitz Criteria, Root-Locus technique. Construction of Root-loci, adding poles and zeros to G(s)H(s) on the root loci.

Unit-IV: Frequency-response Analysis

Introduction to Frequency domain specifications -Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – Gain and Phase margin. Design P, PI, and PD & PID controllers

Unit-V: State variable Analysis (8 hours)

Concepts of state variables- State space model- Diagonalization of State Matrix- Solution of state equations-Eigen values and Stability Analysis-State Transition Matrix (STM) -Concept of controlLaboratoryility and observability.

Text Books :

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.

Reference Books:

1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009

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CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1:Engineering knowledge	1.1	1.1.1
	PO3:Design/Development of solutions	3.2	3.2.3
CO2	PO1:Engineering knowledge	1.1	1.1.1
	PO3:Design/Development of solutions	3.2	3.2.3
CO3	PO1:Engineering knowledge	1.1	1.1.1
	PO2: Problem analysis	2.1	2.1.2
CO4	PO1:Engineering knowledge	1.1	1.1.1
	PO4:Conductinvestigations of complex problems	4.1	4.1.2
CO5	PO1:Engineering knowledge	1.1	1.1.1
	PO2: Problem analysis	2.1	2.1.2

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B.Tech- III Year **Semester: I** **Branch: EEE,ECE,CE,ME**

Subject Code 19AMC9902	Subject Name CONSTITUTION OF INDIA	L 2	T 0	P 0	Credits: 0

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the Powers and functions of Governor, President, Judiciary.
5. Discuss the functions of local administration bodies.

Syllabus

Unit:1 **4 hrs**

History of Making of the Indian Constitution - History Drafting Committee, (Composition & Working)

Unit:2 **8 hrs**

Philosophy of the Indian Constitution - Preamble Salient Features

Unit:3 **8hrs**

Contours of Constitutional Rights & Duties - Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

Unit:4 **8hrs**

Organs of Governance - Parliament – Composition - Qualifications and Disqualifications - Powers and Functions - Executive, President, Governor - Council of Ministers -Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions.

Unit:5 **8hrs**

Local Administration - District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayati raj: Introduction, PRI: ZillaPachayat - Elected officials and their roles, CEO Zilla Panchayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

Suggested books for reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 2	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 3	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 4	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 5	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2	6.1.1

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B. Tech III Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0410	DIGITAL ELECTRONICS AND LOGIC DESIGN	3	0	0	3

Course Outcomes:

After completion of the course, student will be able to

CO1: Understand various number systems, Boolean Functions and Logic gates.

CO2: Apply k-map and Q-M methods to minimize and realize switching functions.

CO3: Analyze and Design combinational logic circuits

CO4: Analyze and Design sequential logic circuits

CO5: Analyze and Compare different types of Programmable logic devices.

UNIT I

Number System & Boolean Algebra:

Digital Systems, Binary Numbers, Number base conversions, complements of numbers, Signed binary numbers, Binary codes.

Boolean Algebra-Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, other logic operations & Logic gates.

UNIT II

Gate Level Minimization:

Introduction to K-Map, four variable & Five variable K-map, POS & SOP Simplification, don't care conditions, NAND & NOR Implementation, Other two-level Implementation, Ex-or Function, Tabular Method- Simplification of Boolean function using Tabulation Method.

UNIT III

Combinational Logic Circuits:

Combinational circuits, Analysis & Design procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Code Converters, Magnitude comparator, Decoder, Encoders, Multiplexers, De-multiplexer

UNIT IV

Sequential Logic Circuits:

Sequential Circuits, Latches, Flips-Flops - RS, JK, Master-Slave JK, D & T flip flops, Analysis of Clocked sequential circuits, State Reduction & Assignment, Design procedure, Registers & Counters – Registers, Shift Registers, Ripple Counters, Synchronous counters, asynchronous counters.

Asynchronous sequential circuits - Introduction, Analysis Procedure, Design Procedure, Reduction of State flow tables, Race-free State Assignment, Hazards.

UNIT V

Programmable Devices:

Memory organization, classification of semiconductor memories, ROM, PROM, DROM, EPROM, EEPROM, RAM, expansion of memory, CCD, Flash memories, content addressable memory, programmable logic devices, PROM at PLD, programmable logic array (PLA) programmable array logic (PAL), field programmable gate array (FPGA).

Text Books:

1. M.Morris Mano & Michel D. Ciletti,"Digital Design", 5th Edition Pearson.
2. Zvi Kohavi and Nirah K.Jha, "Switching theory and Finite Automata Theory", 3rd Edition Cambridge.

References:

1. Subratha Goshal, "Digital Electronics", Cambridge

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2. Comer, "Digital & State Machine Design", Third Indian edition, OXFORD

CO	PO	CI	PI
CO1	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO2	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO3	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO4	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1
	PO3: Design/Development of Solutions	3.3	3.3.1
CO5	PO1:Engineering knowledge	1.3	1.3.1
	PO2:Problem analysis	2.3	2.3.1

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B. Tech III Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0412	ANALOG AND DIGITAL COMMUNICATIONS	3	0	0	3

Course Outcomes:
Upon completing this course, the student will be able to
CO1. Describe of various amplitude modulation and demodulation techniques.
CO2. Understand various angle modulation and demodulation techniques.
CO3. Explain AM, FM Transmitters and Receivers.
CO4. Analyze and design the various pulse modulation techniques.
CO5. Design various digital carrier modulation techniques and baseband transmission.

UNIT-I:
Amplitude Modulation: Modulation, Amplitude Modulation, Limitations and Modifications of Amplitude Modulation-switching modulator, detection of AM waves: envelope detector, DSB-SC modulation- Time and frequency domain description, Balanced modulators, Synchronous Detector, Costas Receiver, Quadrature Carrier Multiplexing, SSB modulation Generation - frequency and phase discrimination methods , Detection methods, VSB modulation, generation and detection method

UNIT-II:
Angle Modulation: Angle modulation, FM, PM, Relationship between FM and PM, NBFM, WBFM, Transmission bandwidth of FM waves, Generation of FM: Direct, Indirect Demodulation of FM signals : Balanced slope detector, PLL, Noise in AM and FM

UNIT III:
Transmitters & Receivers: AM Transmitters, FM Transmitters, Radio Receivers-types, RF Section and Characteristics, Mixer, IF section, AGC, Frequency Tracking , RF receivers
Pulse Modulation: PAM, Pulse time modulation –PWM and PPM, Generation and detection, Time Division Multiplexing.

UNIT–IV
Digital Modulation: Block diagram of Digital communication system, Advantages of Digital Communication Systems, PCM Generation and Reconstruction, Quantization, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM

UNIT-V
Digital Carrier Modulation Schemes: ASK, FSK, PSK –Modulator and detector, Comparison of digital carrier modulation schemes, M-ary Signaling Schemes, QAM.
Baseband Transmission: Signal Receiver, Probability of error-ASK, FSK, PSK, Optimum Receiver, Coherent reception, ISI, Eye Diagrams

Text Books:

1. Simon Haykin, Introduction to Analog & Digital Communications, Second edition, Wiley Publications, 2014
2. K. Sam Shanmugam, Digital and Analog Communication Systems, Wiley Publications, 2007

Reference Books:

1. Principles of Communication Systems - Herbert Taub, Donald L Schiling, Goutam Saha, 3rd Edition, Mcgraw-Hill, 2008.
2. B.P.Lathi, Modern Digital and Analog Communication Systems, 4/e, Oxford University Press, 2017.

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3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2: Problem analysis	2.1	2.1.2
CO2	PO2: Problem analysis	2.1	2.1.2
CO3	**PO1: Engineering knowledge**	1.4	1.4.1
CO4	PO3: Design/Development of Solutions	3.3	3.3.1
CO5	PO3: Design/Development of Solutions	3.4	3.4.1

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AK20-REGULATIONS

B. Tech II Year III Semester

Course Code	Course Title	L	T	P	Credits
	Skill Oriented Course				
20ASC0401	**ELECTRONIC CIRCUIT DESIGN**	1	0	2	2

Course Outcomes:
Upon completion of the course students will be able to:
CO1: Identify basic Electronic Components
CO2: Understand Fundamentals of Circuit Design.
CO3: Construct different Power Supply circuits.
CO4: Analyze Printed Circuit Boards.
CO5: Design a Electronic circuit as a mini project.

List of Contents

1. IDENTIFICATION OF ELECTRONIC COMPONENTS:
Samples of Wire, Coaxial Cable, Capacitors, Diodes, Fuses, Integrated Circuits, Light Emitting Diodes (LED), Transistors, Resistors, Rectifiers, Zener Diodes, Solder, Transformers, Potentiometer, Photo Resistors.

2. FUNDAMENTALS OF CIRCUIT DESIGN:
Diode applications, Clipping and Clamping Circuits with Diodes, Rectifier Circuits, Transistors, Selection and analysis of Components, sensing devices and display devices.

3. POWER SUPPLY DESIGN:
Introduction to various types of power supplies. Estimation of power supply requirements and power loss in electronic products. Selection of appropriate power supplies for the given primary power sources (230VAC/Battery).

4. EVOLUTION AND CLASSIFICATION OF PRINTED CIRCUIT BOARDS:
Challenges in Modern PCB, Design and Manufacturing, PCB fabrication, PCB design considerations/ design rules for analog, digital and power applications.

5. MINI PROJECT:
Students should complete their Mini Project based on the above concepts.

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B. Tech II Year III Semester

Course Code	Course Title	L	T	P	Credits
20AMC9901	BIOLOGY FOR ENGINEERS	2	0	0	0

Course Outcomes:

Upon completion of the course students will be able to

CO1: Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.

CO2: Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.

CO3: Brief about human physiology.

CO4: Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.

CO5: Know about application of biological principles in different technologies for the production of medicines and pharmaceutical molecules through transgenic microbes, plants and animals.

UNIT I:
INTRODUCTION TO BASIC BIOLOGY

Evolution: Different patterns of evolution, Darwin's theory of evolution, 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, Brief introduction to five kingdoms of classification, Tissue Engineering.

UNIT II:
INTRODUCTION TO BIOMOLECULES

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

UNIT III:
HUMAN PHYSIOLOGY

Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle, Central Nerves System and Excretory system.

UNIT IV:
INTRODUCTION TO MOLECULAR BIOLOGY AND RECOMBINANT DNA TECHNOLOGY

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. DNA technology. Introduction to gene cloning.

UNIT V:
APPLICATION OF BIOLOGY

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, Properties and Classification of virus, Immune response to virus. Definitions-Pandemic, Epidemic and outbreak, pandemic alert system ranges, Prevention of pandemic disease and pandemic preparation.

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B. Tech II Year III Semester

Course Code	Course Title	L	T	P	Credits
20APC0404	ELECTRONIC DEVICES AND CIRCUITS LABORATORY	0	0	3	1.5

Course Outcomes:
Upon completion of the course students will be able to
CO1: Test and operate diodes and special electronic devices.
CO2: Construct and operate rectifiers without and with filters.
CO3: Construct and operate BJT, FET in different configurations.
CO4: Design DC biasing circuits for Transistors.
CO5: Design amplifiers using BJTs and FETs.

LIST OF EXPERIMENTS:

1. PN Junction Diode Characteristics
2. Zener Diode Characteristics and Zener Diode as Voltage Regulator.
3. Rectifiers (With and Without Filter).
4. BJT Characteristics (CB Configuration).
5. BJT Characteristics (CE Configuration).
6. FET Characteristics (CS Configuration).
7. SCR Characteristics
8. Transistor Biasing
9. BJT-CE Amplifier
10. Emitter Follower-CC Amplifier
11. FET-CS Amplifier
12. UJT Characteristics

EQUIPMENT REQUIRED FOR LABORATORYORATORY

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 etc.

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
CO2	PO 2: Problem analysis	2.3	2.3.1
CO3	PO 2: Problem analysis	2.3	2.3.1
CO4	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 3: Design/Development of solutions	3.3	3.3.1

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B. Tech II Year III Semester

Course Code	Course Title	L	T	P	Credits
20APC0405	SIGNALS AND SYSTEMS LABORATORY	0	0	3	1.5

Course Outcomes:
Upon completion of the course students will be able to
CO1: Understand basics of MATLABORATORY syntax, functions and programming.
CO2: Generate and characterize various signals and perform the basic operations
CO3: Design and analyze linear time-invariant (LTI) systems and compute its response
CO4: Analyze the spectral characteristics of signals using Fourier analysis.
CO5: Analyze the systems using Laplace transforms and Z-transforms.

LIST OF EXPERIMENTS

1. Write program to generate Standard Signals/Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write 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 program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write program to convolve two discrete time sequences. Plot all the sequences.
6. Write program to find autocorrelation and cross correlation of sequences.
7. Write program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System.
8. Write 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 program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
11. Write program for removal of noise by Autocorrelation / Cross correlation
12. Write a program for waveform Synthesis using Laplace Transform and to plot pole-zero diagram in S-plane / Z-plane of given signal/sequence

Note: All the experiments are to be simulated using MATLABORATORY or equivalent software

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CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 3: Design/Development of Solutions	3.3	3.3.1
			3.3.2
	PO 4: Conduct investigations of complex problems	4.3	4.3.1
			4.3.2
			4.3.3.
			4.3.4
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.4	2.4.1
			2.4.2
			2.4.3
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO3	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
	PO 10: Communication	10.3	10.3.1
			10.3.2
CO4	PO 4: Conduct investigations of complex problems	4.2	4.2.1
			4.2.2
		4.3	4.3.1
			4.3.2
			4.3.3
			4.3.4
CO5	PO 3: Design/Development of solutions	3.3	3.3.1
			3.3.2
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
AK20-REGULATIONS

B. Tech II Year III Semester

Course Code	Course Title	L	T	P	Credits
20APC0406	SWITCHING THEORY AND LOGIC DESIGN LABORATORY	0	0	3	1.5

Course Outcomes:
Upon completion of the course students will be able to

CO1: Ability to verify all logic gates.
CO2: Ability to Design combinational circuits.
CO3: Ability to design flip flops.
CO4: Ability to design counters.
CO5: Ability to design sequence generator.

LIST OF EXPERIMENTS:

1. Verification of Basic Logic Gates
2. Realization of basic gates using Universal Gates
3. Half adder and Full Adder
4. Half Subtractor and Full Subtractor
5. Parallel Adder/Subtractor
6. Code Converters
7. Encoder/Decoder
8. Flip-Flops
9. Shift Registers
10. Counters
11. Johnson/Ring Counters
12. Sequence Generator

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO3	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO4	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1

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