B.Tech
III Year I Semester

ANNAMAC
HARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)-AK19 REGULATIONS
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

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
19APC0411	ANTENNAS AND WAVE PROPAGATION	3	0	0	3

Course Outcomes:
After completion of the course, student will be able to
CO1: Apply parametric equations for the calculation of antenna parameters in the far field region.
CO2: Identify Loop antenna, helical antenna, horn antenna and its parameters.
CO3: Compute Micro-strip antenna, Reflector and Lens antennas and its parameters.
CO4: Analyze principle of pattern multiplication for antenna arrays
CO5: Explain different modes of Wave propagation in atmospheric layers.

UNIT - I
Antenna Basics: Introduction, Basic antenna parameters- patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain, Antenna Apertures, Effective height, Field Zones, Polarization – Linear, Elliptical, & Circular polarizations, Antenna impedance, Front–to-back ratio, Antenna theorems.
Dipole Antennas: Basic Maxwell's equations, Retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole– Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Natural current distributions, Fields from oscillating dipole, Illustrative problems.

UNIT- II
VHF, UHF and Microwave Antennas - I: **Loop Antennas** - Introduction, Small Loop, Comparison of far fields of small loop and short dipole, **Arrays with Parasitic Elements** - Yagi - Uda Arrays, Folded Dipoles & their characteristics. **Helical Antennas**- Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial and Normal Modes. **Horn Antennas**- Types, Fermat's Principle, Optimum Horns, Design considerations of Pyramidal Horns, Illustrative Problems.

UNIT - III
VHF, UHF and Microwave Antennas - II: **Micro strip Antennas**- Introduction, features, advantages and limitations, Rectangular patch antennas- Geometry and parameters, characteristics of Micro strip antennas, Impact of different parameters on characteristics, **Reflector antennas** - Introduction, Flat sheet and corner reflectors, parabola reflectors- geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features, **Lens Antennas** - Geometry of Non-metallic Dielectric Lenses, Zoning , Tolerances, Applications, Illustrative Problems.

UNIT- IV
Antenna Arrays: Definition, Patterns, arrays of 2 Isotropic sources Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, Antenna,
Measurements: Introduction, Concepts- Reciprocity, Near and Far Fields, Pattern Measurement, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

UNIT – V
Wave Propagation: Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, Ray/Mode concepts.
Ground wave propagation - Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections.
Space wave propagation - Introduction, Super refraction, duct propagation, fading and path loss calculations.
Sky wave propagation - Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Illustrative problems.

TEXT BOOKS:

1. John D. Kraus and Ronald J. Marhefka and Ahmad S.Khan, "Antennas and wave propagation," TMH, New Delhi, 4th Ed., (special Indian Edition), 2010.
2. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems," PHI, 2ndEdn, 2000.

REFERENCES:

1. C.A. Balanis, "Antenna Theory- Analysis and Design," John Wiley & Sons, 2 ndEdn., 2001.
2. K.D. Prasad, SatyaPrakashan, "Antennas and Wave Propagation," Tech. India Publications, New Delhi, 2001.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1:Engineering knowledge	1.3	1.3.1
CO2	PO2:Problem analysis	2.1	2.1.2
CO3	PO2:Problem analysis	2.3	2.3.2
CO4	PO3: Design/Development of Solutions	3.2	3.2.2
CO5	PO2:Problem analysis	2.2	2.2.2

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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.

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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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0413	INTEGRATED CIRCUITS AND APPLICATIONS	3	0	0	3

Course Outcomes:
CO1: Understand the basic building blocks of linear integrated circuits and its characteristics.
CO2: Ability to understand feedback amplifiers and analyze its frequency response.
CO3: Analyze the linear and non-linear applications of operational amplifiers.
CO4: Realize the importance of specialized applications of Operational Amplifier.
CO5: Understand the different types of Analog to Digital Converters and Digital to Analog Converters.

UNIT – I
DIFFERENTIAL AMPLIFIERS: Differential amplifier configurations, Balanced and unbalanced output differential amplifiers, current mirror, level Translator.
OPERATIONAL AMPLIFIERS: Introduction, Block diagram, Ideal op-amp, Equivalent Circuit, Voltage Transfer curve, open loop op-amp configurations. Introduction to dual OP-AMP TL082 as a general purpose JFET-input Operational Amplifier.

UNIT-II
FEED BACK AMPLIFIERS :
Introduction, feedback configurations, voltage series feedback, voltage shunt feedback and differential amplifiers, properties of Practical op-amp.
FREQUENCY RESPONSE: Introduction, compensating networks, frequency response of internally compensated op-amps and non compensated op-amps, High frequency op-amp equivalent circuit, open loop gain Vs frequency, closed loop frequency response, circuit stability, slew rate.

UNIT-III
OP-AMP APPLICATIONS-1
DC and AC amplifiers, peaking amplifier, summing, scaling and averaging amplifiers, instrumentation amplifier, voltage to current converter, current to voltage converter, integrator, differentiator, active filters, First and Second order Butterworth filter and its frequency response.

UNIT-IV
OP-AMP APPLICATIONS -2
Oscillators, Phase shift and wein bridge oscillators, Square, triangular and sawtooth wave generators, Comparators, zero crossing detector, Schmitt trigger, characteristics and limitations.
SPECIALIZED APPLICATIONS: 555 timer IC (monostable & astable operation) & its applications, PLL, operating principles, Monolithic PLL, applications, analog multiplier and phase detection.

UNIT V
A/D AND D/A CONVERTERS
Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications – Flash type – Successive Approximation type – Single Slope type – Dual Slope type – A/D Converter using Voltage-to-Time Conversion – Over-sampling A/D Converters,

TEXT BOOKS:
1. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd, 2nd Edition, 2003.
2. K. LalKishore,"Operational Amplifiers and Linear Integrated Circuits", Pearson Education,2007.

REFERENCES:

1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", PHI, 4th edition, 1987.
2. R.F.Coughlin& Fredrick Driscoll, "Operational Amplifiers & Linear Integrated Circuits", 6th Edition, PHI.
3. David A. Bell, "Operational Amplifiers & Linear ICs", Oxford University Press, 2nd edition, 2010.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.1	1.3.1
CO: 2	PO 1: Engineering knowledge	1.1	1.3.1
CO: 3	PO 3: Design/Development of Solutions	3.2	3.2.3
CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.3
CO: 5	PO 3: Design/Development of Solutions	3.2	3.2.3

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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.

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
19APE0402	MATLABORATORY PROGRAMMING	3	0	0	3

Course Outcomes (COs): Student can able to do
CO 1: Understand the MATLABORATORY Desktop, Command and Graph Windows
CO 2: Calculate simple and complex problems using MATLABORATORY
CO 3: Compute Elementary and User defined mathematical functions
CO 4: Perform arithmetic & logical operations and create Plotting
CO 5: Find solutions for various Linear Algebraic equations

UNIT-I: Introduction to MATLABORATORY
MATLABORATORY Interactive Sessions, Menus and the toolbar, computing with MATLABORATORY, Script files and the Editor Debugger, MATLABORATORY Help System, Programming in MATLABORATORY.

UNIT-II: Arrays
Arrays, Multidimensional Arrays, Element by Element Operations, Polynomial Operations Using Arrays, Cell Arrays, Structure Arrays.

UNIT-III: Functions & Files
Elementary Mathematical Functions, User Defined Functions, Advanced Function Programming, Working with Data Files.

UNIT-IV: Programming Techniques
Program Design and Development, Relational Operators and Logical Variables, Logical Operators and Functions, Conditional Statements, Loops, the Switch Structure, Debugging Mat Laboratory Programs.
Plotting :XY- plotting functions, Subplots and Overlay plots, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.

UNIT-V: Linear Algebraic Equations
Elementary Solution Methods, Matrix Methods for (Linear Equations), Cramer‟s Method, Undetermined Systems, Order Systems.

TEXT BOOKS:
1. G. H. Golub and C. F. Van Loan, Matrix Computations, 3rd Ed., Johns Hopkins University Press, 1996.
2. B. N. Datta, Numerical Linear Algebra and Applications, Brooks/Cole, 1994 (out of print) 3. L. Elden, Matrix Methods in Data Mining and Pattern Recognition, SIAM Press, 2007

REFERENCES:
1. NA-digest, http://www.netlib.org/na-digest-html
2. Societyfor Industrial and Applied Mathematics(SIAM), see http://www.siam.org
3. Google “MATLABORATORY Primer” or “MATLABORATORY Tutorial” and you should be able to access lots of free MATLABORATORY.

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	4.3	4.3.1,4.3.3
CO3	PO5: Modern tool usage	5.2	5.2.1
CO4	PO3: Design/Development of Solutions	3.2	3.2.1
CO5	PO3: Design/Development of Solutions	3.2	3.2.1

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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.

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:

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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(Autonomo
us) AK 19
Regulations

B.Tech- III Year **Semester: I** **Branch:**

EEE,ECE,CE,ME

Subject Code 19AMC9902	Subject Name CONSTITUTION OF INDIA	L 3	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.

SylLaboratoryus

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.

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)-AK19 REGULATIONS
B. Tech III Year I Semester

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)-AK19 REGULATIONS
B. Tech III Year I Semester

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
	PO2:Problem analysis	2.3	2.3.1

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0416	INTEGRATED CIRCUITS AND APPLICATIONS LABORATORYORATORY	0	0	2	1

Minimum of Ten experiments to be conducted
All experiments are based upon 741 / TL 082/ASLK Kits.

1. Study the characteristics of negative feedback amplifier
2. Summing and Subtractor Amplifier
3. Design of an instrumentation amplifier
4. Study the characteristics of regenerative feedback system with extension to design an Astable multi vibrator
5. Study the characteristics of integrator circuit
6. Design of Analog filters – I
7. Design of Analog filters – II
8. DC-DC Converter
9. Design of a function generator
10. Design of a Voltage Controlled Oscillator
11. Design of a Phase Locked Loop (PLL)
12. Design of a low drop out regulator

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 1: **Engineering knowledge**	1.4	1.4.1
CO: 3	PO 2: **Problem Analysis**	2.4	2.4.4
CO: 4	PO 3: **Design/Development of Solutions**	3.4	3.4.2
CO: 5	PO 2: **Problem Analysis**	2.3	2.3.2