Year: IV   **Semester: I**   **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0219	SWITCHGEAR AND PROTECTION	3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to:
1. Acquire knowledge on various types of fuses, breakers and relays used for power system protection.
2. Design protection system for generators and transformers.
3. Identify various types of the relays in protecting feeders, lines and bus bars.
4. Demonstrate the protection of a power system from over voltages.

UNIT – I SWITCHGEAR FOR PROTECTION
Fuses: Definitions, characteristics, types, HRC fuses.
Circuit Breakers: Elementary Principles of Arc Interruption, Restriking Voltage and Recovery Voltage - Restriking Phenomenon, Average and Maximum RRRV, Current Chopping and Resistance Switching - CB Ratings and Specifications – Auto Reclosures - Types of Circuit Breakers: Air blast, Air break, Oil, SF6, Vacuum circuit breakers, Minimum Oil Circuit Breakers and Earth leakage circuit breakers - Difference between circuit breakers and isolators– making and breaking capacity.

UNIT – II RELAYS
Electromagnetic Relays - Basic Requirements of Relays – Primary and Backup Protection - Construction Details of – Attracted Armature, Balanced Beam, Inductor Type and Differential Relays – Universal Torque Equation – Characteristics of Over Current, Direction and Distance Relays. Static Relays – Advantages and Disadvantages – Definite Time, Inverse and IDMT.
Static Relays – Comparators – Amplitude and Phase Comparators. Microprocessor Based Relays – Advantages and Disadvantages – Block Diagram for Over Current (Definite, Inverse and IDMT) and Distance Relays.

UNIT – III PROTECTION OF GENERATORS & TRANSFORMERS
Principles and need for protective schemes – Equipment earthing and neutral grounding - Protection of Generators against Stator Faults, Rotor Faults and Abnormal Conditions. Restricted Earth Fault and Inter-Turn Fault Protection – calculation of percentage winding unprotected. Protection of Transformers: Percentage Differential Protection, Numerical Problems on Design of CT Ratio, Buchholtz Relay Protection, Numerical Problems.

UNIT – IV PROTECTION OF FEEDERS & LINES
Protection of Feeder (Radial & Ring Main) Using Over Current Relays. Protection of Transmission Line – 3 Zone Protection Using Distance Relays. Carrier Current Protection. Protection of Bus Bars.

UNIT – V OVER VOLTAGES IN POWER SYSTEMS

Generation of Over Voltages in Power Systems - Protection against Lightning over Voltages - Valve Type and Zinc-Oxide Lighting Arresters - Insulation Coordination – Surge arresters – Special earthing for lightning arresters.

TEXT BOOKS:

1. Badri Ram, D.N Viswakarma, "Power System Protection and Switchgear", TMH Publications, 2011.
2. Sunil S Rao, "Switchgear and Protection", Khanna Publishers, 1992.

REFERENCE BOOKS:

1. C.L.Wadhwa, "Electrical Power Systems", New Age international (P) Limited, Publishers, 2012.
2. Y.G. Paithankar , "Transmission network Protection", Taylor and Francis,2009.
3. Bhuvanesh Oza, "Power system protection and switch gear", TMH, 2010.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
CO3	PO1: Engineering knowledge	1.3	1.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Year: IV   Semester: I   Branch of Study: EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0220	HIGH VOLTAGE ENGINEERING	2	0	0	2

COURSE OUTCOMES:

On the completion of this course the student will be able to:
1. Discuss and analyze the various types of electrical stress control techniques in gas and vacuum insulation systems
2. Derive and analyze the expression of current growth and breakdown voltage due to various mechanisms of gaseous breakdown in dielectrics/ insulation
3. Derive and analyze the various mechanisms of breakdown in liquid and solid dielectrics breakdown
4. Acquire knowledge on generation and measurement of high voltage and high current.
5. Acquire knowledge on over voltage and insulation coordination in electric power systems.

UNIT-I High voltages in electrical systems and electric stress
Levels of High voltage – Electrical insulation and Dielectrics – importance of electric field intensity in the dielectrics – Electric field stresses – gas / vaccum as insulator - estimation and control of electric stress – Surge voltage their distribution and control.

UNIT-II Conduction and breakdown in gases
Gases as insulating media - Collision Processes – Ionization Processes – Townsend's current growth equation – Current growth in the presence of secondary processes - Townsend's criterion for breakdown - the experimental determination of coefficients α and γ – breakdown in electro negative gases.

UNIT-III Conduction and breakdown in Liquid, solid dielectrics
Liquids as insulator – conduction and breakdown in pure liquids – conduction and breakdown in commercial liquids – testing of insulating oils – breakdown in solid dielectrics – intrinsic, electromechanical and thermal - breakdown in composite dielectrics.

UNIT-IV Generations and measurements of high voltages and currents
Generations of high direct current and alternating voltages – generation of impulse voltages and currents – Measurement of high Voltage and current: direct, alternating and impulse – measurement of dielectric constant and loss factor - partial discharge measurement.

UNIT-V Over voltage and insulation coordination in electric power system
Natural causes for over voltages – lightning switching and temporary over voltage – Protection against over voltage – Bewley's lattice diagram – principles of insulation coordination on high voltage and extra high voltage power system.

TEXT BOOKS:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 5rd Edition,2013.
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition, 2000.

REFERENCE BOOKS:

1. Extra High Voltage AC Transmission Engineering , Rakosh Das Begamudre, New Age International (P) Ltd., New Delhi – 2007.
2. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 2010.
3. High Voltage Engineering:, E. Kuffel, W. S. Zaengl, J. Kuffel, Cbs Publishers New Delhi, 2nd Edition, 2005.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
CO3	PO1: Engineering knowledge	1.3	1.3.1
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

(AUTONOMOUS)

B. Tech IV Year I Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0411	**EMBEDDED SYSTEMS**	3	0	0	3

Course Outcomes:

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

CO1: Understand the fundamental concepts of Embedded systems.

CO2: Analyze TM4C Architecture, Instruction Set, addressing modes to develop programs for various applications   using Assembly and Embedded C.

CO3: Develop an embedded system by interfacing the microcontrollers and IDE tools.

CO4: Figure out problems using TM4C On chip Resources such as Timer, Clock System, Low Power Modes/techniques and Interrupt Structure.

CO5: Implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.

UNIT-I

INTRODUCTION TO EMBEDDED SYSTEMS

Embedded system introduction, host and target concept, embedded applications, features and architecture considerations for embedded systems- ROM, RAM, timers; data and address bus concept, Embedded Processor and their types, Memory types, overview of design process of embedded systems, programming languages and tools for embedded design.

UNIT-II

EMBEDDED PROCESSOR ARCHITECTURE

CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture. Introduction to ARM architecture and Cortex – M series, Introduction to the TM4C family viz. TM4C123x & TM4C129x and its targeted applications. TM4C block diagram, address space, on-chip peripherals (analog and digital) Register sets, addressing modes and instruction set basics.

UNIT- III

OVERVIEW OF MICROCONTROLLER AND EMBEDDED SYSTEMS

Embedded hardware and various building blocks, Processor Selection for an Embedded System, Interfacing Processor, Memories and I/O Devices, I/O Devices and I/O interfacing concepts, Timer and Counting Devices, Serial Communication and Advanced I/O, Buses between the Networked Multiple Devices. Embedded System Design and Co-design Issues in System Development Process, Design Cycle in the Development Phase for an Embedded System, Uses of Target System or its Emulator and In-Circuit Emulator (ICE), Use of Software Tools for Development of an Embedded System Design metrics of embedded systems - low power, high performance, engineering cost, time-to-market.

UNIT-IV

MICROCONTROLLER FUNDAMENTALS FOR BASIC PROGRAMMING

 I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals,

programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on TM4C, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming. Basic Timer, Real Time Clock (RTC), Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

UNIT-V

EMBEDDED COMMUNICATIONS PROTOCOLS AND INTERNET OF THINGS

Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, Implementing and programming UART, SPI and I2C, SPI interface using TM4C.Case Study: Tiva based embedded system application using the interface protocols for communication with external devices "Sensor Hub BoosterPack" Embedded Networking fundamentals, IoT overview and architecture, Overview of

wireless sensor networks and design examples. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications Building IoT applications using CC3100 user API.Case Study: Tiva based Embedded Networking Application: "Smart Plug with Remote Disconnect and Wi-Fi Connectivity"

Text Books:

1. Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers, 2014,

Create space publications ISBN: 978-1463590154.
2. Embedded Systems: Introduction to ARM Cortex - M Microcontrollers, 5th edition Jonathan W Valvano, Create space publications ISBN-13: 978-1477508992
3. Embedded Systems 2E Raj Kamal, Tata McGraw-Hill Education, 2011 ISBN-0070667640, 9780070667648

References:

1. http://processors.wiki.ti.com/index.php/HandsOn_Training_for_TI_Embedded_Processors
2. http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop
3. http://www.ti.com/ww/en/simplelink_embedded_wi-fi/home.html
4. CC3100/CC3200 SimpleLink™ Wi-Fi® Internet-on-a-Chip User Guide Texas Instruments Literature Number: SWRU368A April 2014–Revised August 2015

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
CO2	PO 1: Engineering knowledge PO 3: Design/Development of solutions	3.4	3.4.2
CO3	PO 3: Design/Development of solutions	3.1	3.1.1
CO4	PO 5: Modern tool usage	3.4	3.4.2
CO5	PO 3: Design/Development of Solutions PO 5: Modern tool usage	3.4	3.4.2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

B.Tech   **IV Year**   **I Semester**   **BRANCH:**
EEE

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0502	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

Course Outcomes:
1. Demonstrate the basic elements of a relational database management system,
2. Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respective data.
3. Apply normalization for the development of application software.
4. Define Transactions which preserve the integrity of database
5. Ability to understand Storage and Indexing Techniques

UNIT-I
Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators, History of Data base Systems.
Introduction to Data base design , ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views Destroying/ altering Tables and Views.

UNIT-II
Relational Algebra and Calculus: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational Calculus - Domain relational calculus - Expressive Power of Algebra and calculus.
Form of Basic SQL Query - Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT-III
Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

UNIT-IV
Transaction Management - Transaction Concept - Transaction State - Implementation of Atomicity and Durability - Concurrent - Executions - Serializability - Recoverability - Implementation of Isolation - Testing for serializability.

Concurrency Control - Lock - Based Protocols - Timestamp Based Protocols - Validation - Based Protocols - Multiple Granularity.
Recovery System-Failure Classification-Storage Structure-Recovery and Atomicity - Log - Based Recovery - Recovery with Concurrent Transactions - Buffer Management - Failure with loss of nonvolatile storage - Advance Recovery systems - Remote Backup systems.

UNIT-V
Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing - Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.
Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.
Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:
1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition, 2006.

REFERENCES:
1. Database Systems, 6th edition, Ramez Elmasri, Shamkat B. Navathe, Pearson Education, 2013.
2. Database Systems Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
3. Introduction to Database Systems, C.J. Date, Pearson Education.
4. Database Management Systems, G.K. Gupta, McGrawHill Education.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO3: Design of Solutions	3.1	3.1.3
CO2	PO3: Design of Solutions	3.1	3.1.3
CO3	PO3: Design of Solutions	3.3	3.3.1
CO4	PO4: Conduct investigations of complex problems	4.2	4.2.1
CO5	PO3: Design of Solutions	3.4	3.4.1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI
(AUTONOMOUS)

Year: IV   **Semester: I**   **Branch of Study: EEE**

Subject Code	Subject Name	L	T	P	Credits
19APC0101	Mechanics of Materials	3	0	0	3

Course Outcomes:
1: Understand the system of forces on bodies.
2: Determine the centroid and moment of inertia for different cross-sections.
3: Understand the concepts of stress, strain, generalized Hooke's law, elastic moduli.
4: Develop shear force and bending moment diagrams for different load cases.
5: Compute the slope and deflection of simple beams

UNIT - I
Introduction to Mechanics: Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams and Equations of Equilibrium of Coplanar Systems, support reactions for simply supported beam.

UNIT - II
Centroid and Center of Gravity: Introduction – Centroids of rectangular, triangular, circular, I, L and T sections. **Area moment of Inertia**: Introduction – Definition of Moment of Inertia of rectangular, triangular, circular, I, L and T sections - Radius of gyration, perpendicular axis theorem and parallel axis theorem.

UNIT – III
Simple Stresses and Strains:
Types of stresses and strains – Hooke's law – Stress – strain diagram for mild steel – working stress – Factor of safety – lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of Varying section – Composite bars – Temperature stresses.

UNIT – IV
Shear Force and Bending Moment:
Definition of beam – types of beams – Concept of Shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and over changing beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads – point of contra flexure – Relation between S.F, B.M and rate of loading at section of a beam.

UNIT – V
Deflection of Beams: Uniform bending – slope, deflection and radius of curvature - Determination of slope and deflection for cantilever and simply supported beams under point loads and U.D.L. -Mohr's theorems – Moment area method –Conjugate beam method.

TEXT BOOKS:
1. R.K Bansal, Engineering Mechanics, Lakshmi Publications.
2. R. K. Bansal, Strength of Materials, Lakshmi Publications House Pvt. Ltd.
3. R. Subramanian, Strength of Materials, Oxford University Press.
REFERENCES:
1. S.S. Bhavakatti, Engineering Mechanics, New Age Publishers.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

Year: IV   **Semester: I**   **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0201	ELECTRICAL DISTRIBUTION SYSTEMS	3	0	0	3

COURSE OUTCOMES:

On the completion of this course the student will be able to:
1. Understand basics of distribution systems and substations.
2. To understand about modelling of various loads.
3. To perform distribution load flow solutions.
4. To evaluate power loss and feeder cost.
5. To know the principles of SCADA, Automation distribution system and management

UNIT-I: DISTRIBUTION SYSTEM FUNDAMENTALS
Brief description about electrical power transmission and distribution systems, Different types of distribution sub-transmission systems, Substation bus schemes, Factors effecting the substation location, Factors effecting the primary feeder rating, types of primary feeders, Factors affecting the primary feeder voltage level, Factors effecting the primary feeder loading.

UNIT-II: DISTRIBUTION SYSTEM SUBSTATIONS AND LOADS
Substations: Rating of a distribution substation for square and hexagonal shaped distribution substation service area, K constant, Radial feeder with uniformly and non-uniformly distributed loading. Loads: Various types of loads, Definitions of various terms related to system loading, detailed description of distribution transformer loading, feeder loading.

UNIT-III: DISTRIBUTION SYSTEM LOAD FLOW
Exact line segment model, Modified line model, approximate line segment model, Step-Voltage Regulators, Line drop compensator, Forward/Backward sweep distribution load flow algorithm – Numerical problems.

UNIT-IV: VOLTAGE DROP AND POWER LOSS CALCULATION
Analysis of non-three phase primary lines, concepts of four-wire multi-grounded common-neutral distribution system, Percent power loss calculation, Distribution feeder cost calculation methods, Capacitor installation types, types of three-phase capacitor-bank connections, Economic justification for capacitors – Numerical problems

UNIT-V: DISTRIBUTION AUTOMATION
Distribution automation, distribution management systems, distribution automation system functions, Basic SCADA system, outage management, decision support applications, substation automation, control feeder automation, database structures and interfaces.

Text Books:
1. William H. Kersting, "Distribution System Modelling and Analysis", CRC Press, Newyork, 2002.
2. Turan Gonen, "Electric Power Distribution System Engineering", McGraw-Hill Inc., New Delhi, 1986.

Reference Books:
1. James Northcote-Green and Robert Wilson, "Control and automation of electrical power distribution systems", CRC Press (Taylor & Francis), New York, 2007.

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

Year: IV   **Semester: I**   **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0202	POWER SEMICONDUCTOR DRIVES	3	0	0	3

COURSE OUTCOMES:
On the completion of this course the student will be able to:
1. Identify the choice of the electric drive system based on their applications.
2. Explain the operation of single and multi quadrant electric drives.
3. Analyze single phase and three phase rectifiers fed DC motors as well as chopper fed DC motors.
4. Explain the speed control methods for AC-AC & DC-AC converters fed to Induction motors and Synchronous motors with closed loop, and open loop operations.

UNIT – I CONVERTER FED DC MOTORS
Classification of Electric Drives, Basic elements of Electric Drive, Dynamic Control of a Drive system, Stability analysis, Introduction to Thyristor Controlled Drives, Single Phase, Three Phase Semi and Fully Controlled Converters Connected to D.C Separately Excited and D.C Series Motors – Continuous Current Operation – Output Voltage and Current Waveforms – Speed and Torque Expressions – Speed – Torque Characteristics- Problems.

UNIT – II FOUR QUADRANT OPERATION OF DC DRIVES
Introduction to Four Quadrant Operation – Motoring Operations, Electric Braking – Plugging, Dynamic and Regenerative Braking Operations. Four Quadrant Operation of D.C Motors by Dual Converters – Closed Loop Operation of DC Motor (Block Diagram Only).

UNIT – III CHOPPER FED DC MOTORS
Single Quadrant, Two Quadrant and Four Quadrant Chopper Fed DC Separately Excited and Series Excited Motors – Continuous Current Operation – Output Voltage and Current Wave Forms – Speed Torque Expressions – Speed Torque Characteristics – Problems on Chopper Fed D.C Motors.

UNIT – IV CONTROL OF INDUCTION MOTOR
Induction Motor Stator Voltage Control and Characteristics - AC Voltage Controllers – Waveforms – Speed Torque Characteristics - Stator Frequency Control and Characteristics. Voltage Source and Current Source Inverter - PWM Control – Comparison of VSI and CSI Operations - Closed Loop Operation of Induction Motor Drives (Block Diagram Only) – Principles of Vector Control Static Rotor Resistance Control – Slip Power Recovery – V/f control of Induction Motor.

UNIT – V CONTROL OF SYNCHRONOUS MOTORS
Separate Control & Self Control of Synchronous Motors – Operation of Self Controlled Synchronous Motors by VSI and CSI Cycloconverters. Load Commutated CSI Fed Synchronous Motor – Operation – Waveforms – Speed Torque Characteristics – Applications – Advantages and Numerical Problems – Closed Loop Control Operation of Synchronous Motor Drives (Block Diagram Only), Introduction to variable frequency control.

TEXT BOOKS:
1. Power semiconductor controlled drives, G K Dubey, Prentice Hall, 1995.
2. Modern Power Electronics and AC Drives, B.K.Bose, PHI, 2002.

REFERENCE BOOKS:
1. Power Electronics, MD Singh and K B Khanchandani, Tata McGraw-Hill Publishing company, 2008.
2. Power Electronic Circuits, Devices and applications, M.H.Rashid, PHI, 2005.
3. Electric drives Concepts and Applications, Vedam Subramanyam, Tata McGraw Hill Publications, 2nd Edition, 2011.

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
CO3	PO1: Engineering knowledge	1.3	1.3.1
CO4	PO1: Engineering knowledge	1.3	1.3.1
		1.4	1.4.1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Year: IV **Semester: I** **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0203	ADVANCED CONTROL SYSTEMS	3	0	0	3

COURSE OUTCOMES:

On the completion of this course the student will be able to:
1. Design state feedback controller and state observer.
2. Understand and analyse linear and nonlinear systems using phase plane method.
3. Understand and analyse nonlinear systems using describing function method.
4. Understand and design optimal controller.
5. Understand optimal estimator including Kalman Filter.

UNIT I STATE VARIABLE ANALYSIS
Introduction- concepts of state variables and state model-State model for linear continuous time systems, Diagonalisation- solution of state equations- Concepts of controllability and observability.

UNIT II STATE VARIABLE DESIGN
Introduction to state model: Effect of state feedback - Pole placement design: Necessary and sufficient condition for arbitrary pole placement, State regulator design Design of state observers- Separation principle- Design of servo systems: State feedback with integral control.

UNIT III SAMPLED DATA ANALYSIS
Introduction spectrum analysis of sampling process signal reconstruction difference equations The Z transform function, the inverse Z transform function, response of Linear discrete system, the Z transform analysis of sampled data control systems, response between sampling instants, the Z and S domain relationship. Stability analysis and compensation techniques.

UNIT IV NON LINEAR SYSTEMS
Introduction, common physical nonlinearites, The phase plane method: concepts, singular points, stability of non linear systems, construction of phase trajectories system analysis by phase plane method. The describing function method, stability analysis by describing function method, Jump resonance.

UNIT V OPTIMAL CONTROL
Introduction: Classical control and optimization, formulation of optimal control problem, Typical optimal control performance measures - Optimal state regulator design: Lyapunov equation, Matrix Riccati equation - LQR steady state optimal control – Application examples.

TEXT BOOKS:
1. M.Gopal, "Digital Control and State Variable Methods", 4th edition, Mc Graw Hill India, 2012
2. K. Ogata, 'Modern Control Engineering', 5th Edition, Pearson, 2012.
3. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.

REFERENCES:
1. M.Gopal, Modern Control System Theory, 3rd edition, New Age International Publishers, 2014.
2. William S Levine, "Control System Fundamentals," The Control Handbook, CRC Press, Tayler and Francies Group, 2011.
3. Ashish Tewari, 'Modern Control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.
4. T. Glad and L. Ljung,, "Control Theory –Multivariable and Non-Linear Methods", Taylor & Francis, 2002.
5. D.S.Naidu, "Optimal Control Systems" First Indian Reprint, CRC Press, 2009.

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Year: IV   **Semester: I**   **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0204	**POWER SYSTEM OPERATION AND CONTROL**	3	0	0	3

COURSE OUTCOMES:
On the completion of this course the student will be able to:
1. Understand to deal with problems in Power System as Power System Engineer.
2. Understand to deal with AGC problems in Power System.
3. Understand to deal the problems in hydro electric and hydro thermal problems.
4. Understand the complexity of reactive power control problems and to deal with them.
5. Understand the necessity of deregulation aspects and demand side management problems in the modern power system era.

UNIT-I: ECONOMIC OPERATION OF POWER SYSTEMS
Brief description about electrical power systems, introduction to power system operation and control, Characteristics of various steam units, combined cycle plants, cogeneration plants, Steam units economic dispatch problem with & without considering losses and its solutions, B Matrix loss formula – Numerical problems.

UNIT-II: HYDRO-THERMAL COORDINATION AND OPTIMAL POWER FLOW
Hydro-thermal Coordination: Characteristics of various types of hydro-electric plants and their models, Introduction to hydro-thermal Coordination, Scheduling energy with hydro-thermal coordination, Short-term hydro-thermal scheduling. Optimal Power Flow: Optimal power flow problem formulation for loss and cost minimisation, Solution of optimal power flow problem using Newton's method and Linear Programming technique – Numerical problems.

UNIT-III: AUTOMATIC GENERATION CONTROL
Speed governing mechanism, modelling of speed governing mechanism, models of various types of thermal plants (first order), definitions of control area, Block diagram representation of an isolated power system, Automatic Load Frequency control of single area system with and without control, Steady state and dynamic responses of single area ALFC loop, Automatic Load-frequency control of two area system, Tie-line bias control of two area and multi-area system, Static response of two-area system – Numerical examples.

UNIT-IV: REACTIVE POWER CONTROL
Requirements in ac power transmission, factors affecting stability & voltage control, fundamental transmission line equation, surge impedance, Natural loading, uncompensated line on open circuit, uncompensated line under load, types of compensations on compensated transmission lines, passive and active compensators, uniformly distributed fixed and regulated shunt compensation, series compensation, compensation by sectioning – Numerical problems.

UNIT-V: OPERATION OF MODERN POWER SYSTEMS
Principle of economics, utility functions, power exchanges, electricity market models, market power indices, ancillary services, transmission and distribution charges, principles of transmission charges, transmission pricing methods, demand-side management, regulatory framework – Numerical problems.

TEXT BOOKS:
1. Allen J. Wood and Bruce F. Wollenberg, "Power Generation, Operation and Control", 2nd edition, John Wiley & Sons, Inc., New York, 1996.
2. D P Kothari and I J Nagrath, "Power System Engineering", McGraw Hill Education India Pvt. Limited, Chennai, 3e, 2019.

REFERENCES:
1. Olle I. Elgerd, "Electric Energy Systems Theory: An Introduction", TMH Publishing Company Ltd., New Delhi, 2nd edition, 1983.
2. T J E Miller, "Reactive Power Control in Electric Systems", John Wiley & Sons, New York, 1982.

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

Year: IV   **Semester: I**   **Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0205	FLEXIBLE AC TRANSMISSION SYSTEMS	3	0	0	3

COURSE OUTCOMES:
On the completion of this course the student will be able to:
1. Understand various control issues, for the purpose of identifying the scope and for selection of specific FACTS controllers.
2. Apply the concepts in solving problems of simple power systems with FACTS controllers.
3. Design simple FACTS controllers and converters for better transmission of electric power.
4. Understand to deal with problems in Power System as Power System Engineer.

UNIT-I: CONCEPTS OF FLEXIBLE AC TRANSMISSION SYSTEMS
Transmission line Interconnections, Power flow in parallel lines, Mesh systems, Stability considerations, Relative importance of controllable parameters, Basic types of FACTS controllers, Shunt controllers, Series controllers, Combined shunt and series controllers, Benefits of FACTS.

UNIT-II: VOLTAGE AND CURRENT SOURCED CONVERTERS
Single Phase Full Wave Bridge Converter, Three Phase Full Wave Bridge Converter, Transformer Connections for 12-Pulse Operation, 24 and 48-Pulse Operation, Three Level Voltage Sourced Converter, Pulse Width Modulation (PWM) Converter, Converter Rating, Concept of Current Sourced Converters, Thyristor based converters, Current Sourced Converter with Turn off Devices, Comparison of Current Sourced and Voltage Sourced Converters.

UNIT-III: STATIC SHUNT COMPENSATORS
Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, Improvement of Transient Stability, Power Oscillation Damping, Methods of Controllable VAR Generation, Variable Impedance Type Static VAR Generators, Switching Converter Type VAR Generators, Hybrid VAR Generators, SVC and STATCOM, Transient Stability Enhancement and Power Oscillation Damping, Comparison Between STATCOM and SVC, V-I, V-Q Characteristics, Response Time.

UNIT-IV: STATIC SERIES COMPENSATORS
Objectives of Series Compensation, Voltage Stability, Improvement of Transient Stability, Power Oscillation Damping, Sub-synchronous Oscillation Damping, Variable Impedance Type Series Compensators, GTO Thyristor Controlled Type Series Capacitor (GCSC), Thyristor Switched Series Capacitor (TSSC), Thyristor-Controlled Series Capacitor(TCSC), Basic Operating Control Schemes for GCSC, TSSC, and TCSC, Switching Converter Type Series Compensators, The Static Synchronous Series Capacitor(SSSC), Transmitted Power Versus Transmission Angle Characteristic,
Control Range and VA Rating, Capability to Provide Real Power Compensation.

UNIT-V: POWER FLOW CONTROLLERS

The Unified Power Flow Controller-Basic Operating Principles, Conventional Transmission Control Capabilities, Independent Real and Reactive Power Flow Control. Control Structure, Basic Control System for P and Q Control, Dynamic Performance, The Interline Power Flow Controller (IPFC), Basic Operating Principles and Characteristics, Generalized and Multifunctional FACTS Controllers.

TEXT BOOKS:

1. Understanding FACTS – Concepts and technology of Flexible AC Transmission systems, Narain G. Hingorani, Laszlo Gyugyi, IEEE Press, WILEY, 1st Edition, 2000, Reprint 2015.
2. FACTS Controllers in Power Transmission and Distribution, Padiyar K.R., New Age International Publishers, 1st Edition, 2007.

REFERENCE BOOKS:

1. Flexible AC Transmission Systems: Modelling and Control, Xiao – Ping Zhang, Christian Rehtanz, Bikash Pal, Springer, 2012, First Indian Reprint, 2015.
2. FACTS – Modelling and Simulation in Power Networks, Enrigue Acha,Claudio R. Fuerte – Esquival, Huge Ambriz – perez, Cesar Angeles – Camacho, WILEY India Private Ltd., 2004, Reprint 2012.

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

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

B. Tech IV Year	I Semester			BRANCH: EEE	

Course Code	Course Title	L	T	P	Credits
19APC0418	DIGITAL SIGNAL PROCESSING	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Analyze discrete signals and systems in time and frequency domains.

CO2: Apply FFT algorithms to efficient computation of DFT.
CO3: Implement and realize various structures of IIR and FIR systems.
CO4: Design & analyze various Analog Filters and Digital Filters.
CO5: Understand and apply the basics of multi rate digital signal processing.

UNIT I: Introduction to DSP

Review of discrete-time signals and systems – Time domain analysis of discrete-time signals & systems, Frequency domain analysis of discrete-time signals and systems.
Discrete Fourier Transform: Frequency-domain sampling and reconstruction of discrete-time signals, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT, Frequency analysis of signals using the DFT.

UNIT II: Fast Fourier Transform

Efficient computation of the DFT – Direct computation of DFT, Divide and conquer approach to computation of DFT, Radix-2, Radix-4, and Split radix FFT algorithms, Implementation of FFT algorithms, Applications of FFT algorithms – Efficient computation of the DFT of two real sequences, 2N point real sequences, Use of the FFT algorithm in linear filtering and correlation, Quantization errors in the computation of DFT.

UNIT III: Analog & Digital Filters

General considerations – Causality and its implications, Characteristics of practical Frequency Selective Filters, Design of Finite Impulse Response (FIR) filters – Symmetric and asymmetric FIR filters, Design of linear phase FIR filters using windows, Design of linear phase FIR filters by the frequency sampling method, Comparison of design methods for linear phase FIR filters, Design of Impulse Invariance Response (IIR) filters from analog filters – IIR filter design by approximation of derivatives, by Impulse invariance, and by bilinear transformation methods, Characteristics of commonly used analog filters, Design examples of both FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

UNIT IV: Realization of Filters

Structures for the realization of discrete-time systems, Structures for FIR systems - Direct form, Cascade form, Linear Phase Realization and Lattice structures, Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures, lattice – Ladder structure.

UNIT V: Multirate DSP

Introduction, Decimation, and interpolation, Sampling rate conversion by a rational factor, Implementation of sampling rate conversion, Multistage implementation of sampling rate conversion, Sampling rate conversion of band pass signals, Sampling rate conversion by arbitrary factor, Applications of multirate signal processing.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications," Pearson Education/PHI, 4th ed., 2007.
2. Sanjit K Mitra, "Digital signal processing, A computer base approach," Tata McGraw Hill, 3rd edition, 2009.

REFERENCES:

1. A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2nd ed., Pearson Education, 2012.
2. B. P. Lathi, "Principles of Signal Processing and Linear Systems," Oxford Univ. Press, 2011.
3. Li Tan, Jean Jiang, "Digital Signal Processing, Fundamentals and Applications," Academic Press, Second Edition, 2013.

CO	PO No. and Keyword	Competency	Performance
CO1	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
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 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.1	2.1.1
			2.1.3
		2.3	2.3.1
			2.3.2
CO4	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
CO5	PO 1: Engineering knowledge	1.3	1.3.1
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
	PO 2: Problem analysis	2.4	2.4.1
			2.4.2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

(AUTONOMOUS)

AK19 Regulations

Year: IV **Semester: I** **Branch : Common to all**

Humanities Elective

Subject Code 19AHE9901	Subject Name Technical Writing	L T P 2 0 0	Credit: 2

Course Objectives:

1. To acquaint students with a variety of forms of writing in science and technology;

2. Develop research skills;

3. Discuss and apply writing and formatting techniques;

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.

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 b) 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.

<u>**References:**</u>

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

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1 9.2.2 9.2.3 9.2.4
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.	10.2	10.2.1 10.2.2
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.	10.3	10.3.1 10.3.2

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

Humanities Elective

Subject Code 19AHE9906	Subject Name Effective Technical Communication	L T P 2 0 0	Credit: 2

Course Objectives :

1. To develop awareness in students of the relevance and importance of technical communication and presentation skills.
2. To prepare the students for placements
3. To sensitize the students to the appropriate use of non-verbal communication
4. To train students to use language appropriately for presentations and interviews

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: Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

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)

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

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.

IV B.Tech   **I Semester**   **Branch: EEE**

Subject Code 19ASA0501	Subject Name SOFT SKILLS	L T P 2 0 0	Credit: 2

Course Outcomes:

Students will be able to:

1. Recognize the importance of verbal and non-verbal skills
2. Develop the interpersonal and intrapersonal skills
3. Apply grammatical structures to formulate sentences and correct word forms.
4. Create trust among people and develop employability skills

SYLLABUS

UNIT – I:

Grammar: Articles, Prepositions, Antonyms, Synonyms.
Vocabulary: Basics of Communication (Definition, Types of communication). Importance of body language in corporate culture, Body language (Facial expressions – eye contact – posture – gestures – Proxemics – Haptics – Dress Code – Paralanguage –

Tone, pitch, pause & selection of words), Impromptu speeches.

Articles:

Web links: https://learnenglish.britishcouncil.org/grammar/a1-a2-grammar/articles-1
https://www.youtube.com/watch?v=ueEp6U8td1I

Prepositions:

Web links: https://www.grammarbook.com/grammar/probPrep.asp

Antonyms, Synonyms.

Web links: https://www.youtube.com/watch?v=-mLRoxWM8dI
https://www.youtube.com/watch?v=IEOrOPVMxiM
https://www.it.iitb.ac.in/~vijaya/ssrvm/worksheetscd/getWorksheets.com/Language%20Arts/syn_ant.pdf

Basics of Communication (Definition , Types of communication).

Web links: https://wikieducator.org/INTRODUCTION_TO_COMMUNICATION

 Importance of body language in Corporate culture

Web links: https://www.forwardfocusinc.com/consciously-communicate/the-importance-of-body-language-in-the-workplace/

Body language (Facial expressions – eye contact – posture – gestures – Proxemics – Haptics – Dress Code – Paralanguage –Tone, pitch, pause & selection of words)

Web links: https://open.lib.umn.edu/communication/chapter/4-2-types-of-nonverbal-communication/
https://en.wikipedia.org/wiki/Nonverbal_communication

 Impromptu speeches.

Web links: https://www.write-out-loud.com/impromptu-public-speaking-topics.html;
https://faculty.washington.edu/mcgarrit/COM220/online%20readings/sample%20critique.pdf

UNIT – II :

Grammar: Tenses, Idioms and Phrases, One word substitutes.
Vocabulary: Public speaking - *Oral presentations*, writing skills – *Short Essay writing and E- mail writing.*

Tenses

Web links: https://www.englisch-hilfen.de/en/grammar/english_tenses.htmj; https://onlymyenglish.com/tenses/;
https://www.englishpage.com/verbpage/verbtenseintro.html;
https://www.englishclub.com/grammar/verb-tenses.htm

Idioms and Phrases:

Web links: https://www.britannica.com/list/7-everyday-english-idioms-and-where-they-come-from
https://eslexpat.com/english-idioms-and-phrases/;
https://onlineteachersuk.com/english-idioms/;

One word substitutes:

Web links: https://www.careerpower.in/one-word-substitution.html;
https://www.hitbullseye.com/Vocab/One-Word-Substitute-List.php;
https://englishan.com/one-word-substitution-set-1/;

Public speaking - *Oral presentations*

Web links: https://egyankosh.ac.in/bitstream/123456789/26773/1/Unit-14.pdf;
https://www.skillsyouneed.com/rhubarb/preparing-oral-presentations.html;
https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-methods-of-delivery/

Writing skills – *Short Essay writing and E-mail writing.*

Web links: https://www.kibin.com/essay-writing-blog/important-essay-writing-skills/
https://www.scribendi.com/academy/articles/academic_essay_writing_skills.en.html ;
https://www.microsoft.com/en-us/microsoft-365/business-insights-ideas/resources/improve-email-writing-skills;

UNIT – III :

Grammar : Direct and Indirect speeches, Active and Passive voice, Drawing inferences (reading
comprehensions and listening comprehensions)
Vocabulary: Leadership Skills – Negotiation skills - Team-building – *Debate.* Leadership
Skills – Negotiation skills - Team-building

Direct and Indirect speeches:

Web links: https://onlymyenglish.com/direct-and-indirect-speech/
https://learnenglish.britishcouncil.org/grammar/b1-b2-grammar/reported-speech-1-statements
https://www.perfect-english-grammar.com/reported-speech.html

Active and Passive voice,

Web links: https://www.englishclub.com/grammar/passive-voice.htm
https://www.gingersoftware.com/content/grammar-rules/verbs/passive-voice/
https://nps.edu/web/gwc/revising-passive-voice-into-active-voice

Drawing inferences (reading comprehensions and listening comprehensions)

Web links: https://www.readingrockets.org/strategies/inference
https://www.thoughtco.com/making-inferences-3111201
https://www.comprehensionconnection.net/2019/03/exploring-difference-between-making.html

Vocabulary: Leadership Skills – Negotiation skills - Team-building – *Debate.*
Leadership Skills – Negotiation skills - Team-building

Web links: https://online.hbs.edu/blog/post/negotiation-skills
https://www.bumc.bu.edu/facdev-medicine/files/2014/08/BUSM-Leasership-training.pdf
https://in.indeed.com/career-advice/career-development/negotiation-skills
https://www.thebalancecareers.com/what-is-team-building-1918270

Debate:

Web links: https://noisyclassroom.com/debate-topics/
https://www.collegeessay.org/blog/debate-topics
https://www.edu.gov.mb.ca/k12/cur/socstud/frame_found_sr2/tns/tn-13.pdf

UNIT – IV:

Grammar: Common errors, Rearrangement of sentences.
Vocabulary: Resume writing, Pre-interview preparation , Group discussion.

Common errors, Rearrangement of sentences:

Web links: https://www.letsstudytogether.co/sentence-arrangement-questions-pdf-for-banking-exams-ibps-sbi-po-and-clerk/
https://www.youtube.com/watch?v=e8nO3zZzkZs

Vocabulary: Resume writing, Pre-interview preparation , Group discussion.

Web links: https://www.youtube.com/watch?v=PfJg-67smf4
https://www.youtube.com/watch?v=-lXjbph22Fk

UNIT – V:

Grammar : Verbal ability tests.
Vocabulary: Mock interviews, Post interview Etiquette.

Verbal ability tests.

Web links: https://prepinsta.com/infosys-english-verbal-questions/
https://www.indiabix.com/online-test/verbal-ability-test/random
https://www.allindiaexams.in/online-test/online-general-english-test/61

Vocabulary: Mock interviews, Post interview Etiquette.

Web links: https://www.youtube.com/watch?v=ZOLCMa2QbdE
https://www.ziprecruiter.com/blog/the-right-way-to-follow-up-after-a-job-interview/
https://www.youtube.com/watch?v=KIoD19uoxt8

References:

1. Barun K. Mitra, "Personality Development and Soft Skills", OXFORD Higher Education 2018.
2. Alka Wadkar, "Life Skills for Success", Sage publications 2016.
3. Robert M Sheffield, "Developing Soft Skills", Pearson, 2010.
4. Diana Booher, "Communicate with Confidence" Tata mcgraw hill, 1994.
5. B.N. Gosh, "Managing Soft skills for Personality development", Tata mcgraw hill 2012.
6. Michael Swan, "Practical English Usage", Oxford publications.
7.Raymond Murphy, "English Grammar in Use", Cambridge 5th Edition
8. Norman Lewis, "Word Power Made Easy", Penguin Publishers.
9. Advanced Grammar in Use A Self-Study Reference and Practice Book for Advanced Learners of English 3rd Edition , Cambridge

List of COs	PO.No. and Key word	Competency Indicator: Description	Performance Indicator Description
CO1	PO 6: 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	6.1	6.1.1
CO2	PO 9: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings	9.2	9.2.1
CO3	PO 10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO4	PO 9: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings	9.2	9.2.1

Year: IV　　　　　　　　**Semester: I**　　　　　　　　**Branch of Study: EEE**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0221	**SWITCHGEAR AND PROTECTION LAB**	0	0	2	1

COURSE OUTCOMES:

1. Understand the operation and characteristics of switch gear used in protection of power systems.
2. Analyze the protection of parallel, radial feeders & over voltage induction relay.
3. Analyze the functioning of various protection schemes using MATLAB.

Conduct any 10 from the following:

1. Study the characteristics of miniature circuit breaker.
2. Study the characteristics of fuse and thermal overload protection.
3. Study the operation and characteristics of over voltage, over current relays.
4. Obtain the ABCD parameters of a given power system.
5. Modeling of Differential Relay using MATLAB.
6. Radial Feeder Protections.
7. Parallel Feeder Protections.
8. Principle of Reverse Power Protection.
9. Differential Protection of Transformer.
10. To the study time Vs voltage characteristics of over voltage induction relay.
11. Characteristics of single, combined and lightning earth pits.
12. Study of efficiency and regulation of a transmission line.
13. Study of string efficiency of insultors.

Text books:
1. A.G.Phadke and J. S. Thorp, "Computer Relaying for Power Systems", Wiley/Research studies Press, 2009
2. A.T. Johns and S. K. Salman, "Digital Protection of Power Systems", IEEE Press,1999

Reference Books:
1. Gerhard Zeigler, "Numerical Distance Protection", Siemens Publicis Corporate Publishing, 2006
2. S.R. Bhide "Digital Power System Protection" PHI Learning Pvt. Ltd. 2014

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.4	1.4.1
	PO2: Problem analysis	2.3	2.3.1
			2.3.2
CO2	PO1: Engineering knowledge	1.3	1.3.1
	PO4: Conduct investigations of complex problems	4.3	4.3.1
CO3	PO5: Modern tool usage	5.1	5.1.1
		5.2	5.2.1