Estd:1980

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)

UG Programmes CE,CSE,ECE,EEE,IT & ME are Accredited by NBA

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

Regulation: R20	**III / IV - B.Tech. I - Semester**

ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2020-21 admitted Batch onwards)

Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20EE3101	Signals and Systems	ES	3	3	0	0	30	70	100
B20EE3102	Power Systems Analysis and Stability	PC	3	3	0	0	30	70	100
B20EE3103	Power Electronics	PC	3	3	0	0	30	70	100
#PE-I	Professional Elective -I	PE	3	3	0	0	30	70	100
#OE-I	Open Elective-I	OE	3	3	0	0	30	70	100
B20EE3108	Electrical Machines-II Laboratory	PC	1.5	0	0	3	15	35	50
B20EE3109	Power Electronics Laboratory	PC	1.5	0	0	3	15	35	50
B20EE3110	Python Programming Laboratory **(Skill Oriented Course)**	SOC	2	1	0	2	--	50	50
B20MC3101	Employability Skills	MC	0	3	0	0	--	--	--
B20EE3111	Summer Internship	PR	1.5	--	--	--	--	50	50
		TOTAL	**21.5**	**19**	**0**	**8**	**180**	**520**	**700**

	Course Code	Course
#PE-I	B20EE3104	Solar and Wind Energy Systems
	B20EE3105	Sensors and Transducers
	B20EE3106	Special Electrical Machines
	B20EE3107	Power Quality
#OE-I	Student has to study one Open Elective offered by AIDS or CE or CSBS or CSE or ECE or IT or ME or S&H from the list enclosed.	

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3101	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

SIGNALS AND SYSTEMS

(For EEE)

Course Objectives: Students will learn

1.	The properties of signals and systems and their classification.
2.	The convolution and differential/difference equation approach for LTI system analysis in time domain.
3.	The Fourier analysis for representation and analysis of periodic signals.
4.	The Fourier Transform to analyze the Continuous Time (CT) and Discrete Time (DT) systems.
5.	About the Z-transform approach for analyzing DT systems and sampling of CT signals.

Course Outcomes: Students will be able to

Sl.no	Outcome	Knowledge Level
1.	**Apply** the properties of continuous time and discrete time signals and systems to classify them.	K3
2.	**Apply** convolution to analyze CT and DT systems in the Time domain.	K3
3.	**Analyze** the spectral characteristics of periodic signals using Fourier series analysis.	K4
4.	**Apply** Fourier Transform to **analyze** the systems.	K3, K4
5.	**Analyze** discrete time signals and systems using Z–Transforms and **apply** sampling theorem for signal conversion.	K3, K4

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO CONTINUOUS –TIME AND DISCRETE –TIME SIGNALS AND SYSTEMS:** Basic continuous time and discrete time signals, Signal Energy and Power, Transformations of the independent variable, Periodic Signals, Even and odd Signals, Complex Exponential signals, The Unit Impulse and Unit step Functions, Classification of systems, Basic system properties.
UNIT-II (10 Hrs)	**LINEAR TIME – INVARIANT (LTI) SYSTEMS:** Representation of signals in terms of impulses, Convolution sum and Convolution integral. Systems described by differential and difference equations. Block diagram representation of LTI systems, Singularity functions.
UNIT-III (10 Hrs)	**FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS:** Approximation of a function by a set of mutually orthogonal functions, The Continuous time and Discrete time Fourier series, Trigonometric and Exponential Fourier series, Convergence of Fourier series, Properties of Fourier Series.

UNIT-IV (10 Hrs)	**CONTINUOUS AND DISCRETE TIME FOURIER TRANSFORM:** Fourier transform of continuous time and discrete time Aperiodic signals and periodic signals, properties of continuous time and discrete time Fourier transforms. Frequency response characterized by linear constant coefficient differential and difference equations. First order and Second order systems and their analysis using Fourier Transform.
UNIT-V (10 Hrs)	**Z-TRANSFORM AND SAMPLING:** The Z-transform, Region of Convergence (ROC), relation between Z-transform and Fourier transform, Properties of z-transform, Inverse z-transform, Determination of transfer function and impulse response of an LTI system, poles and zeros, system stability. Representation of a CT signal by its samples, The Sampling theorem, Reconstruction of a signal from its samples using zero order hold (ZOH), Effect of under sampling, Aliasing effect.
Text Books:	
1.	Signals and Systems, Alan V. Oppenheim, Alan S. Willsky and Ian T. Young, Prentice-Hall.
2.	Principles of Linear Systems and Signals, B. P. Lathi., Oxford University Press.
Reference Books:	
1.	Signals and Systems, H.P.Hsu, Schaum's Outlines, McGraw Hill.
2.	Signals and Systems, A. Anand Kumar, PHI Publishers.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3102	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

POWER SYSTEMS ANALYSIS AND STABILITY

(For EEE)

Course Objectives: Students will learn

1.	About Single line diagram, per unit system, per unit reactance diagram.
2.	Formation of Y-bus, Gauss-seidel method, Newton-Raphson method, fast decoupled method.
3.	To calculate short circuit momentary current, interrupting current, and short circuit MVA.
4.	About Symmetrical components, sequence networks, LG, LL, and LLG Faults on a power system.
5.	About Swing equation, equal area criterion, steady-state stability, and transient stability of a power system.

Course Outcomes: Students will be able to

Sl.no	Outcome	Knowledge Level
1.	**Compute** the p.u. reactance and draw the per unit reactance diagram of a power system.	K3
2.	**Apply** the load flow techniques to **analyze** load flow problems in the power system.	K3, K4
3.	**Compute** short circuit MVA and **analyze** symmetrical fault currents and voltages in a power system.	K3, K4
4.	**Determine** the symmetrical components and un-symmetrical fault currents in a power system.	K3, K4
5.	**Derive** swing equation and apply equal area criterion to **analyze** steady-state and transient stability of a power system.	K3, K4

SYLLABUS

UNIT-I (10 Hrs)	**PER UNIT (P.U.) REPRESENTATION** One- Line Diagram, Impedance or Reactance Diagram, P.U. quantities, P.U. representation of transformer, P.U. Impedance Diagram of a Power System, Equivalent circuit of 3-Winding Transformers.
UNIT-II (10 Hrs)	**LOAD FLOW STUDIES** Network Model Formulation, Y-Bus formation by direct inspection method, Load Flow Problem, Gauss-Seidel Method, Newton-Raphson Method & Fast Decoupled Method of Solving Load Flow Problems.
UNIT-III (10 Hrs)	**SYMMETRICAL FAULT ANALYSIS** Transient on a Transmission line, Short Circuit of Synchronous Machine (No Load), Short Circuit of a loaded Synchronous Machine, Short Circuit MVA Calculations.

UNIT-IV (10 Hrs)	**SYMMETRICAL COMPONENTS and SEQUENCE NETWORKS** The Symmetrical Components transformation, Sequence Impedances of transmission lines, Sequence impedance and Networks of synchronous machine, Sequence impedance and Networks of Transformers, 3-Phase Power in terms of Symmetrical Components. **UN-SYMMETRICAL FAULTS:** LG, LL and LLG Faults on a power system under Unloaded Condition.
UNIT-V (10 Hrs)	**POWER SYSTEM STABILITY** Dynamics of Synchronous Machine, Swing Equation, Steady State Stability, Transient Stability, Equal Area Criterion, Critical Clearing Angle and Critical Clearing time, Solution of Swing Equation by Step-by-Step Method, Factors Affecting Transient Stability.
Text Books:	
1.	Power System Analysis by D.P. Kothari & I.J. Nagarath, 4th Edition, TMH Publication.
2.	Elements of Power System Analysis, William D. Stevenson, Jr, Mc Graw Hill Pub first edition, 1955.
Reference Books:	
1.	Power System Analysis by Hadi Sadat, Mc Graw Hill Pub 1999.
2.	Electrical Power Systems by C.L. Wadhwa, 7th Edition, New Age International Publications, 2017.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3103	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

POWER ELECTRONICS

(For EEE)

Course Objectives: Students will learn

1.	The basic theory of power semiconductor devices.
2.	The principle of operation of phase-controlled rectifiers with different loads
3.	About different chopper circuits and their output voltage control.
4.	About Power conversion in AC-AC converters.
5.	About DC - AC converter and harmonic elimination techniques.

Course Outcomes: Students will be able to

Sl.no	Outcome	Knowledge Level
1.	**Illustrate** thyristor characteristics, turn on and turn off methods, protection circuits and modern power semiconductor devices.	K3
2.	**Illustrate** the phase-controlled rectifiers with different loads.	K3
3.	**Analyze** the operation of choppers.	K3, K4
4.	**Explore** the Cyclo-converter and AC voltage Controller configurations.	K3
5.	**Analyze** the inverter operation, performance parameters and PWM techniques.	K3

SYLLABUS

UNIT-I (10 Hrs)	**POWER SEMICONDUCTOR DEVICES** Introduction - Thyristors – Silicon Controlled Rectifiers (SCRs)–Construction and Operating principle with two transistor analogy – Static V-I characteristics of SCR – Dynamic characteristics of SCR-Gate characteristics, Turn on methods, Turn-off methods-Impulse commutation, Gate driver circuits-Pulse transformer-Optocoupler, Protection circuits-dv/dt protection-di/dt protection- snubber circuit, IGBT and MOSFET- V-I characteristics.
UNIT-II (10 Hrs)	**AC-DC CONVERTERS (PHASE CONTROLLED RECTIFIERS)** Principles of phase-controlled rectification -Study of Single-phase half wave-controlled rectifier with R, RL, RL with freewheeling diode and RLE load, full wave-controlled bridge rectifiers with R, RL and RLE load, semi converter with RL load, Average output voltage expression- Numerical Problems.
UNIT-III (10 Hrs)	**DC-DC CONVERTERS (CHOPPERS)** Step-up, Step-down, Step-up/step-down chopper- input and output voltage relationship-critical value of inductance and capacitance, Duty Cycle control strategies, Numerical Problems.

UNIT-IV (10 Hrs)	**AC-AC CONVERTERS (CYCLOCONVERTERS AND AC VOLTAGE CONTROLLERS)** Principle of cycloconverter operation-Singlephase to Singlephase step-up cycloconverter& step-down cycloconverter with continuous and discontinuous load current. Operation of AC Voltage controllers with R and RL load, RMS value of output voltage, Numerical Problems.
UNIT-V (10 Hrs)	**DC-AC CONVERTERS (INVERTERS)** Principle of operation of Single-phase half bridge and full bridge Inverters with R&RL load, Performance parameters of inverters- Harmonic factor-Total harmonic distortion-Distortion Factor-Lower order harmonics. Three phase Inverters (180^0 and 120^0 modes), Harmonic reduction by PWM technique-Single pulse& Multi pulse width modulation techniques, Current source Inverter–Operation.
Text Books:	
1.	Power Electronics - P.S. Bimbhra- Khanna Publishers, 4th edition.
2.	Power Electronics: Devices, Circuits and Applications – M.H. Rashid, Prentice Hall of India, 3rd edition.
Reference Books:	
1.	Power Electronics – M.D. Singh & K.B. Kanchandhani, Tata McGraw – Hill Publishing Company, 2nd edition
2.	Power Electronics – VedamSubramanyam, New Age International (p) Limited, Publishers, 2^{nd} edition.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3104	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

SOLAR AND WIND ENERGY SYSTEMS

(For EEE)

Course Objectives: Students will learn

1.	About the solar geometry, operation of solar cell and Characteristics, equivalent circuit parameters.
2.	About the Series and Parallel connection of cells, Module design and its protection.
3.	About different Maximum Power Point Tracking (MPPT) techniques and selection of converters for particular PV application.
4.	The basics of wind energy systems and various techniques for the conversion of wind energy into electrical energy.
5.	About the wind generators and modelling of generators in different configurations of wind energy systems.

Course Outcomes: Students will be able to

Sl.no	Outcome	Knowledge Level
1.	**Apply** the fundamental principles to understand the solar geometry, operation of solar cell and **analyze** its Characteristics, equivalent circuit parameters.	K3, K4
2.	**Design** a PV Module and **analyze** series and parallel interconnection schemes.	K4
3.	**Apply** the MPPT techniques and **analyze** the Operating range of Buck, Boost and Buck-Boost converters.	K3, K4
4.	**Apply** the fundamental of wind energy systems to **illustrate** the wind turbine operation and control.	K3, K4
5.	**Illustrate** various configurations of wind energy conversion systems.	K3

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO SOLAR CELLS AND SOLAR RADIATION** Introduction, sun and the earth, the sun - earth movement, angle of sun rays on solar collector, Estimating and measurement of solar radiation- Solar cell - Generation of Photo voltage, Light generated current, I-V Characteristics. Limits of Cell Parameters - Short circuit current, Open circuit voltage, Fill factor and efficiency. Losses in Solar cell - Model of PV cell, Effect of Series & Shunt Resistance, Solar Radiation and Temperature on Efficiency - Simple problems - Recent trends in Solar Cell Technologies.
UNIT-II (10 Hrs)	**SOLAR PHOTOVOLTAIC MODULES DESIGN** Solar PV Modules from solar cells - Series and Parallel connection of cells – Mismatch in Cell/Module, Mismatch in series connection, Mismatch in Parallel connection, Design and structure of PV Modules-number of solar cells in a module, Wattage of Modules, PV Module Power output - I-V Equation of PV Modules- Ratings of PV Modules- I-V and

	Power curve of Module – Effect of Solar radiation and Temperature on PV Modules - Data sheet study - Simple problems.
UNIT-III (10 Hrs)	**SOLAR POWER CONVERSION WITH MPPT** Applications of Solar systems- Standalone mode- Grid connected mode [Elementary treatment only]. MPPT Concept- Concept of load line - Input Impedance of Buck converter, Boost converter and Buck-Boost Converter- Algorithms for MPPT- Perturb and Observe method, Incremental Conductance method.
UNIT-IV (10 Hrs)	**INTRODUCTION TO WIND ENERGY & WIND TURBINE:** Introduction, Basic Principles of Wind Energy Conversion-Nature of the wind, Power in the wind, Maximum Power, Forces on the Blades, Lift and drag, Site selection considerations, Basic Components of a WECS (Wind Energy Conversion System), Wind Energy Collectors- Horizontal Axial Machines, Vertical axis Machines, Number of Blades. Analysis of Aerodynamic Forces acting on the Blade, Power Characteristics of Wind Turbine, Aerodynamic Power Control: Yaw control, Passive Stall, Active Stall, and Pitch Control, Tip Speed Ratio.
UNIT-V (10 Hrs)	**WIND ENERGY CONVERSION SYSTEM CONFIGURATIONS (WECS)** Introduction, Fixed-Speed WECS, Variable-Speed Induction Generator WECS- Wound Rotor Induction Generator with External Rotor Resistance, Doubly Fed Induction Generator WECS with Reduced Capacity Power Converter, SCIG Wind Energy System with Full-Capacity Power Converters, Variable-Speed Synchronous Generator WECS- Configuration with Full-Capacity Back-to-Back Power Converters, Configuration with Diode Rectifier and DC - DC Converters, Configuration with Distributed Converters for Multi winding Generators.
Text Books:	
1.	"Solar Photovoltaics- fundamentals, Technologies and Applications", Chetan Singh Solanki, PHI learning private limited, 3rd edition, 2018.
2.	G. D. Rai, "Non-Conventional Energy Sources", 5th edition, Khanna Publishers, 2015.
3.	Bin Wu,Yongqiang Lang, Navid Zargari and Samir Kouro, "Power Conversion and Control of Wind Energy Systems ", IEEE Press, 2011.
Reference Books:	
1.	"Wind and Solar Power Systems", Mukund R. Patel, CRC Press, 1999.
2.	S.N Bhadra, S.Banerjee and D.Kastha, "Wind Electrical Systems", Oxford University Press, 1st Edition, 2005.
3.	https://archive.nptel.ac.in/courses/117108141

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3105	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

SENSORS AND TRANSDUCERS

(For EEE)

Course Objectives: Students will learn

1.	The basic principles of Sensors & Transducers, classification and their characteristics
2.	About the concepts of Electromechanical and Radiation Sensors
3.	About the basics of thermal sensors
4.	About the basics of Magnetic sensors
5.	The Recent Trends in Sensor Technologies and their applications

Course Outcomes: Students will be able to

Sl.no	Outcome	Knowledge Level
1.	**Apply** the principles to understand the characteristics & classification of Sensors and Transducers	K3
2.	**Explore** the concepts and construction of Electromechanical and Radiation Sensors	K3
3.	**Explore** the concepts and construction of Thermal sensors	K3
4.	**Explore** the concepts and construction of Magnetic sensors	K3
5.	**Illustrate** the Recent Trends in Sensor Technologies and applications	K3

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO SENSORS/TRANSDUCERS** Sensors/Transducers, Principles, Classification, Parameters (Characteristics), Environmental Parameters, Electrical, Mechanical and Thermal Characterizations.
UNIT-II (10 Hrs)	**ELECTROMECHANICAL AND RADIATION SENSORS** Introduction, Inductive Sensors- Sensitivity and Linearity of the Sensor, Ferromagnetic Plunger Type Transducers, Capacitive Sensors- The Parallel Plate Capacitive Sensor, Ultrasonic Sensors. Types of accelerometers- potentiometric type accelerometer, LVDT accelerometers, Piezo electric accelerometer. Basic Characteristics of radiation sensors, Types of Photosensistors /Photodetectors, Photoconductive Cell-The LDR.
UNIT-III (10 Hrs)	**THERMAL SENSORS** Introduction-Gas Thermometric Sensors, Acoustic Temperature Sensor, Thermal Radiation Sensors-Detectors, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors.
UNIT-IV (10 Hrs)	**MAGNETIC SENSORS** Introduction - Hall Effect and Sensors, Inductance and Eddy Current Sensors- Variable Inductance Sensors- Variable gap sensor, Angular/Rotary Movement Transducers- Synchro's, Electromagnetic Flowmeter, Switching Magnetic Sensors- Pulse Wire Sensor, SQUID Sensors.

UNIT-V (10 Hrs)	**RECENT TRENDS IN SENSOR TECHNOLOGIES & APPLICATIONS** Introduction- Film Sensors-Thick Film Sensors-Thin Film Sensors, Semiconductor IC Technology-Standard Methods, Microelectromechanical Systems (MEMS), Nano-sensors. On-board Automotive Sensors, Home Appliance Sensors, Aerospace Sensors, Medical Diagnostic Sensors, Sensors for Environmental Monitoring.

Text Books:	
1.	SENSORS AND TRANSDUCERS Second Edition by D. Patranabis © 2003 by PHI Learning Private Limited, Delhi. ISBN-978-81-203-2198-4
2.	Sawhney A.K., "A Course in Electrical & Electronic Measurement and Instrumentation," Dhanpat Rai & Company Private Limited, New Delhi, 18th Edition, 2007.
Reference Books:	
1.	SENSORS AND TRANSDUCERS Third Edition by I. Sinclair 2011, by Newes Publications, Delhi. ISBN: 0756049321
2.	Measurement Systems: Application & Design, E.A. Doebelin, Mc Graw Hill

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3106	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

SPECIAL ELECTRICAL MACHINES

(For EEE)

Course Objectives: Students will learn

1.	About different types of stepper motors and their applications.
2.	About the characteristics of Permanent Magnet Brushless DC (BLDC) Motor and applications.
3.	About the principle of operation, construction and control of Permanent Magnet Synchronous Motors (PMSM).
4.	About the Switched Reluctance Motor (SRM)and its applications.
5.	About the Synchronous Reluctance Motor (SYRM) and its performance characteristics.

Course Outcomes: Students will be able to

Sl.no	Outcome	Knowledge Level
1.	**Illustrate** the principle of operation and control of different stepper motors.	K3
2.	**Acquire** the knowledge of operation and control of Permanent Magnet Brushless DC Motor.	K3
3.	**Illustrate** the operation and control of Permanent Magnet Synchronous motor.	K3
4.	**Acquire** the knowledge of operation and control of Switched reluctance Motor.	K3
5.	**Illustrate** the operation and control of Synchronous reluctance Motor.	K3

SYLLABUS

UNIT-I (10 Hrs)	**STEPPER MOTOR** Introduction, Variable Reluctance Stepper Motor, Permanent Magnet Stepper Motor, Hybrid Stepper Motor, Torque Equation, Characteristics of Stepper Motor, Open & Closed – loop Control of Stepper Motor, Applications of Stepper Motors.
UNIT-II (10 Hrs)	**PERMANENT MAGNET BRUSHLESS DC MOTOR** Introduction to Permanent Magnet materials –Principle of operation of BLDC Motor – Types –EMF and Torque equations –Commutation - Power Converter Circuits and their controllers – Motor characteristics and control– Applications.
UNIT-III (10 Hrs)	**PERMANENT MAGNET SYNCHRONOUS MOTOR** Construction, Principle of Operation, EMF and Torque equations, Phasor Diagram, Comparison of Conventional Synchronous Motor and PMSM, Control of PMSM, Applications.
UNIT-IV (10 Hrs)	**SWITCHED RELUCTANCE MOTOR** Constructional features, Principle of Working, Basics of SRM Analysis, Torque Equation and Characteristics, Power Converter Circuits & Control of SRM, Rotor Position Measurement, Applications.

UNIT-V (10 Hrs)	**SYNCHRONOUS RELUCTANCE MOTOR** Constructional features – Types – Axial and Radial flux motors – Working principle – Variable Reluctance Motors – Voltage and Torque Equations – Phasor diagram - performance characteristics – Applications.
Text Books:	
1.	E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014
2.	K. Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008
Reference Books:	
1.	T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989
2.	R. Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3107	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

POWER QUALITY

(For EEE)

Course Objectives: Students will learn

1.	The significance of power quality and power quality parameters.
2.	About transient over voltages and protection against transient voltages.
3.	About harmonics, their effects and minimization techniques.
4.	About long duration voltage variations and their regulation.
5.	Various power quality issue mitigation techniques in distribution systems.

Course Outcomes: Students will be able to

Sl.no	Outcome	Knowledge Level
1.	**Acquire** the knowledge of power quality issues and power quality parameters.	K3
2.	**Illustrate** the sources of transient over voltages and protection techniques.	K3
3.	**Analyze** filters for controlling harmonic distortion.	K4
4.	**Analyze** long duration voltage variations and regulation of voltage variations.	K4
5.	**Explore** power quality aspects and protection in distributed generation.	K3

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION** Overview of Power Quality - Concern about the Power Quality - General Classes of Power Quality Problems – Transients -Long-Duration Voltage Variations - Short-Duration Voltage Variations - Voltage Unbalance - Waveform Distortion - Voltage fluctuation - Power Frequency Variations - Voltage Sags and Interruptions -Sources of Sags and Interruptions – Nonlinear loads.
UNIT-II (10 Hrs)	**TRANSIENT OVER VOLTAGES** Source of Transient Over Voltages - Principles of Over Voltage Protection - Devices for Over Voltage Protection - Utility Capacitor Switching Transients - Utility Lightning Protection – Load Switching Transient Problems
UNIT-III (10 Hrs)	**HARMONIC DISTORTION AND SOLUTIONS** Voltage vs. Current Distortion - Harmonics vs. Transients - Power System Quantities Under Non-sinusoidal Conditions - Harmonic Indices – Sources of harmonics - Effects of Harmonic Distortion - Devices for Controlling Harmonic Distortion - Harmonic Filter Design -Control of Harmonics using Passive Filters - Standards on Harmonics.

UNIT-IV (10 Hrs)	**LONG DURATION VOLTAGE VARIATIONS** Principles of Regulating the Voltage - Devices for Voltage Regulation - Utility Voltage Regulator Application - Capacitor for Voltage Regulation - End-user Capacitor Application, Regulating Utility Voltage with Distributed Resources.
UNIT-V (10 Hrs)	**DISTRIBUTED GENERATION AND POWER QUALITY** Resurgence of Distributed Generation - DG Technologies - Interface to the Utility System Power Quality Issues - Operating Conflicts - DG on Low Voltage Distribution Networks - Interconnection standards.
Text Books:	
1.	Electrical Power Systems Quality, Dugan R C, Mc Granaghan M F, Santoso S, and Beaty H W, Third Edition, McGraw-Hill, 2012
2.	Bhim Singh, Ambrish Chandra, Kamal Al-Haddad, "Power Quality Problems and Mitigation Techniques" Wiley Publications, 2015.
Reference Books:	
1.	Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M H J, First Edition, IEEE Press; 2000.
2.	Power Quality Enhancement Using Custom Power Devices – Power Electronics and Power Systems, Gerard Ledwich, ArindamGhosh, Kluwer Academic Publishers, 1st ed,2002.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3108	**PC**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs**

ELECTRICAL MACHINES-II LABORATORY

(For EEE)

Course Objectives: Students will learn

1.	To find voltage regulation of an alternator by using EMF, MMF and ZPF methods
2.	To conduct tests online excited induction generator and synchronous motor.
3.	To conduct No Load and Blocked Rotor testson a 3-Φ and 1-Φ induction motor.
4.	To conduct test on synchronous machine to find X_d and X_q and sequence reactances.
5.	To conduct Load test on 3-Φ induction motor, speed control and speed – torque characteristics of BLDC motor.

Course Outcomes: Student will be able to

Sl.No	Outcome	Knowledge Level
1.	**Investigate** the voltage regulation of an alternator by using EMF, MMF and ZPF methods.	K4
2.	**Analyze** the performance characteristics of Line excited induction generator and Synchronous motor.	K4
3.	**Analyze** the performance characteristics of a 3-Φ and 1-Φ Induction motors.	K4
4.	**Determine** X_d & X_q and sequence reactances of a Synchronous machine.	K4
5.	**Conduct** an experiment on BLDC motor to obtain speed – torque characteristics.	K4

SYLLABUS

1	No Load and Blocked Rotor tests on a three-phase Squirrel cage Induction Motor.
2	Voltage regulation of an Alternator by EMF and MMF methods.
3	Voltage regulation of an Alternator by ZPF method.
4	Characteristics of line excited Induction Generator.
5	Characteristics of Induction start Synchronous Motor.
6	Load test on three phase Slip ring Induction Motor.
7	V and inverted V curves of a Synchronous Motor.
8	Measurement of X_d and $X_q$of a Synchronous Machine.
9	Equivalent circuit of a single-phase Induction Motor
10	Measurement of sequence reactances of a Synchronous Machine.
11	Characteristics and speed control of Brushless DC Motor.

Add on Experiments

1	Characteristics of Schrage motor.
2	Speed control of Induction Motor by pole changing method.

Reference Books:	
1.	Nagrath& Kothari," Electric Machines", TMH, 5th edition
2.	R Krishnan, "Permanent magnet synchronous and brushless DC motor drives", CRC Press,1st edition.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3109	**PC**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs**

POWER ELECTRONICS LABORATORY

(For EEE)

Course Objectives: Students will learn to

1.	Obtain the characteristics of power semiconductor devices
2.	Verify the turn on and turn off methods of SCR
3.	Use various power electronic converters for load requirements
4.	Assess the performance of different converters
5.	Use power electronic converters for AC and DC drives

Course Outcomes: Student will be able to

Sl.no	Outcome	Knowledge Level
1.	**Analyze** the characteristics of semiconductor devices	K4
2.	**Analyze** the triggering and commutation methods for SCR	K4
3.	**Investigate** the performance of Controlled rectifiers, DC-DC converters, AC voltage controllers and cycloconverter.	K4
4.	**Examine** the performance of single phase and three phase inverters.	K4
5.	**Investigate** the speed control of AC and DC drives using power electronic converters.	K4

SYLLABUS

1	Static characteristics of SCR/IGBT/MOSFET
2	R and RC triggering circuits for SCR
3	Single-phase semi-controlled bridge converter with R, R-L load
4	Speed control of DC motor using single phase full converter
5	AC voltage controller using SCR with R - load
6	Single phase cycloconverter with R - load
7	Jones Chopper using SCR with R - load
8	MC-Murray Bedford Inverter using SCR with R - load
9	Single-phase Dual converter using SCR with R - load
10	Three phase Inverter (120^0 and 180^0 mode) using SCR with R - load
11	Three phase Inverter using IGBT with R-load
12	DC-DC (Buck and Boost) converter using MOSFET with R-load
Add-On Experiment	
13	Three phase semi converter with R-load
14	Neutral point clamping (NPC) multilevel inverter with R-load
15	Speed control of 3-Phase inverter fed induction motor based on open loop V/f control

Reference Books:	
1	Power electronics - P.S. Bimbhra- Khanna Publishers, 4th Edition
2	Fundamentals of Electrical Drives by Gopal K. Dubey second edition, Narosa Publishing House

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3110	**SOC**	**1**	**--**	**2**	**2**	**--**	**50**	**3 hrs.**

PYTHON PROGRAMMING LABORATORY

(For EEE)

Course Objectives:

1.	To introduce the basics of Python Programming Language.
2.	To learn how to write loops and decision statements in Python.
3.	To learn how to use strings, lists, tuples, and dictionaries in Python programs
4.	To Introduce File Handling in Python
5.	To introduce the basics of Numpy, Pandas and Matplotlib

Course Outcomes: On the completion of this laboratory course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Write, Test and Debug Python Programs	K3
2.	Implement Conditionals and Loops for Python Programs	K3
3.	Use functions and represent Compound data using Lists, Tuples and Dictionaries	K3
4.	Use python basic libraries in programming	K3

List of experiments

1.	**Basic programs:** a. Write a Python Program to add two numbers b. Write a Python Program to print Maximum of two numbers in Python c. Write a Python Program to print the given number even or not d. Write a Python program to find the largest number among the three input numbers e. Write a Python Program to Convert Fahrenheit to Celsius and Celsius to Fahrenheit f. Write a Python Program to print ASCII Value of a character g. Write a Python Program to generate a random number h. Write a Python program to check the character vowel or consonant.
2.	**Loop Programs:** a. Write a python program to demonstrate wile loop for computing the sum of numbers entered by the user. Terminates when user enters special character 'space'. b. Use a for loop to print a triangle like the one below. Allow the user to specify how high the triangle should be. c. Write a Python program for Fibonacci Sequence d. Python program to check whether a number is Prime or not e. Write a Python program to check palindrome or not f. Write a Python program to Count the Total Digits in a Number using while Loop

	g. Write a Python program to Add Digits of a Number using while Loop h. Write a Python Program to Find Sum of n Numbers using while and for loops
3.	**List Programs:** Take the list x=[100,20,503,3,35,600,73,5,200,400,200,56,10,20,9,1801,300,45678,90] a. find length without using len() function b. find sum of elements without using sum() function c. accept number and display its index without index() method d. Write a Python Program to accept a element and count total of no of occurrences without count() method e. Write a Python Program to print above list elements in reverse order without using reverse() method f. Write a Python Program to store all 1 digit numbers into one list and 2 digit numbers into another list and 3 digit numbers into another list other remaining numbers into another list display g. Store even numbers into one list and odd numbers into another list
4.	**String Programs:** Write a script to accept a string and reverse the string b. Write a script to accept a string and character and remove given character from a given string c. String slicing in Python to rotate a string d. Find words which are greater than given length k e. Python program to Check if a given string is binary string or not f. String Methods
5.	**Tuple Programs :** a. Python – Maximum and Minimum K elements in Tuple b. Create a list of tuples from given list having number and its cube in each tuple c. Python – Remove Tuples of Length K
6.	**Dictionary Programs:** a. Ways to sort list of dictionaries by values in Python – Using itemgetter b. Ways to sort list of dictionaries by values in Python – Using lambda function c. Ways to Sort Dictionary key and values List d. Python Program to find the frequencies of all the characters in that string and return a dictionary with key as the character and its value as its frequency in the given string
7.	**Files Programs:** a. Create a text file “srkr.txt” in python and ask the user to write a single line of text by user input. b. Create a text file “srkreee.txt” in python and ask the user to write separate 3 lines with three input statements from the user. c. Write a program to read the contents of both the files created in the above programs and merge the contents into “merge.txt”. Avoid using the close() function to close the files. d. Count the total number of upper case, lower case, and digits used in the text file

	"merge.txt".
8.	a. Python Program for Binary Search (Recursive and Iterative) b. Python Program for Linear Search
9.	NumPy, Pandas, matplotlib a. Basic mathematical operations- NumPy b. Pandas c. Matplotlib
Reference Books:	
1.	"Learning Python" by Mark Lutz and David Ascher 2nd Edition.
2.	"Think Python: How to Think Like a Computer Scientist", by Allen B. Downey2nd Edition .
e-Resources:	
1.	https://www.python.org/
2.	https://www.geeksforgeeks.org/python-programming-language/
3.	https://www.w3schools.com/python/default.asp

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MC3101	**MC**	**3**	**--**	**--**	**--**	**--**	**--**	**3 Hrs.**

EMPLOYABILITY SKILLS

(Common to Civil, EEE & Mech)

Part-A: Verbal Ability

Course Objectives:

1.	To introduce concepts required in framing grammatically correct sentences and identifying errors While using Standard English.
2.	To familiarize the learner with high frequency words as they would be used in their professional career.
3.	To inculcate logical thinking in order to frame and use data as per the requirement
4.	To acquaint the learner of making a coherent and cohesive sentences and paragraphs for composing a written discourse.
5.	To familiarize students with soft skills and how it influences their professional grow.

Course Outcomes: The students will be able to

S.No	Outcomes	Knowledge Level
1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/company specific tests and frame grammatically Correct sentences while writing.	K3
2	Answer questions on synonyms, antonyms and other vocabulary-based Exercises while attempting CAT, GRE, GATE and other related tests.	K3
3	Use their logical thinking ability and solve questions related to analogy, Syllogisms, and other reasoning-based exercises.	K3
4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.	K3

SYLLABUS

UNIT-I	Spotting Errors, Sentence Improvement
UNIT-II	Synonyms, Antonyms, Frequently Confused Words, Foreign Phrases, Idioms and Phrasal Verbs, Collocations.
UNIT-III	Foreign Phrases, Idioms and Phrasal Verbs, Collocations, Analogies, Odd One Out
UNIT-IV	Sentence completion, Sentence Equivalence, Close Test
UNIT-V	Reading Comprehension, Para Jumbles

Text Books:	
1.	Oxford Learners,, Grammar–Finder by John Eastwood, Oxford Publication.
2.	RS Agarwal books on objective English and verbal reasoning
3.	English Vocabulary in Use-Advanced, Cambridge University Press
4.	Collocations In Use, Cambridge University Press
5.	Soft Skills & Employability Skills by Samina Pillai and Agna Fernandez, Cambridge University Press India Pvt .Ltd.
6.	Soft Skills, by Dr.K.Alex, S. Chand & Company Ltd., New Delhi
Reference Books:	
1.	English Grammar in Use by Raymond Murphy, CUP
2.	Websites: Indiabix,800score, official CAT, GRE and GMAT sites
3.	Material from IMS, Career Launcher and Time institutes for competitive exams
4.	The Art of Public Speaking by Dale Carnegie
5.	The Leader in You by Dale Carnegie
6.	Emotional Intelligence by Daniel Golman
7.	Stay Hungry Stay Foolish by Rashmi Bansal
8.	I have a Dream by Rashmi Bansal.
Part-B: Quantitative Aptitude-I	
Course Objectives:	
1.	To familiarize students with basic problems on numbers and ratios problems.
2.	To enrich the skills of solving problems on time, work, speed, distance and also Measurement of units.
3.	To enable the students to work efficiently on percentage values related to shares, profit and Loss problems.
4.	To inculcate logical thinking by exposing the students to reasoning related questions.
5.	To inculcate logical thinking by exposing the students to reasoning related questions.
Course Outcomes:	

S.No.	Outcomes	Knowledge Level
1.	The students will be able to perform well in calculating on number problems and various units of ratio concepts	K3
2.	The students will be able to solve problems on time and distance and units related solutions	K3
3.	The students will become adept in solving problems related to profit and loss, in specific, quantitative ability	K3

4.	The students will present themselves well in the recruitment process using analytical and logical skills which he or she developed during the course as they are very important for any person to be placed in the industry	K3
5.	The students will earn to apply Logical thinking to the problems of Syllogisms and be able to effectively attempt competitive examinations like CAT, GRE, GATE for further studies	K3
SYLLABUS		
UNIT-I	Numbers, LCM and HCF, Chain Rule, Ratio and Proportion Importance of different types of numbers and uses of them: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF, applications of LCM, HCF. Importance of chain rule, Problems on chain rule, Introducing the concept of ratio in three Different methods, Problems related to Ratio and Proportion	
UNIT-II	Time and work, Time and Distance Problems on manpower and time related to work, Problems on alternate days, Problems on hours of working related to clock, Problems on pipes and cistern, Problems on combination of the some or all the above, Introduction of time and distance, Problems on average speed, Problems on Relative speed, Problems on trains, Problems on boats and streams, Problems on circular tracks, Problems on polygonal tracks, Problems on races.	
UNIT-III	Percentages, Profit Loss and Discount, Simple interest, Compound Interest, Partnerships, shares and dividends. Problems on percentages-Understanding of cost price, selling price, marked price, discount, percentage of profit, percentage of loss, percentage of discount, Problems on cost price, selling price, market price, discount. Introduction of simple interest, Introduction of compound interest, Relation between simple interest and compound interest, Introduction of partnership, Sleeping partner concept and problems, Problems on shares and dividends, and stocks.	
UNIT-IV	Introduction, number series, number analogy, classification, Letter series, ranking, directions Problems of how to find the next number in the series, Finding the missing number and related sums, Analogy, Sums related to number analogy, Ranking of alphabet, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Usage of directions north, south, east, west, Problems related to directions north, south, east, west.	
UNIT-V	Data sufficiency, Syllogisms Easy sums to understand data sufficiency, Frequent mistakes while doing data sufficiency, Syllogisms Problems.	

Text Books:	
1.	Quantitative aptitude by RS Agarwal
2.	Verbal and nonverbal reasoning by RS Agarwal
3.	Puzzles to puzzle you by shakunatala devi.
References:	
1.	Barrons by Sharon Welner Green and IraK Wolf (Galgotia Publications pvt. Ltd.)
2.	Websites: m4maths, Indiabix, 800score, official CAT, GRE and GMAT sites
3.	Material from IMS, Career Launcher and Time,, institutes for competitive exams
4.	Books for CAT by Arun sharma.
5.	Elementary and Higher algebra by HS Hall and SR Knight.
Websites:	
1.	www.m4maths.com
2.	www.Indiabix.com
3.	www.800score.com
4.	Official GRE site
5.	Official GMAT site

Regulation: R20	III / IV - B.Tech. II - Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2020-21 admitted Batch onwards)

Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20EE3201	Logic Design and Microprocessors	PC	3	3	0	0	30	70	100
B20EE3202	Control Systems	PC	3	3	0	0	30	70	100
B20HS3202	Universal Human Values-2 : Understanding Harmony	HS	3	3	0	0	30	70	100
#PE-II	Professional Elective -II	PE	3	3	0	0	30	70	100
#OE-II	Open Elective-II	OE	3	3	0	0	30	70	100
B20EE3207	Control Systems Laboratory	PC	1.5	0	0	3	15	35	50
B20EE3208	Logic Design and Microprocessors Laboratory	PC	1.5	0	0	3	15	35	50
B20EE3209	Electrical System Simulation Laboratory	PC	1.5	0	0	3	15	35	50
B20HS3203	Soft Skills **(Skill Oriented Course)**	SOC	2	1	0	2	--	50	50
B20HS3204	*Gender Sensitization	HS	0	2	0	0	--	--	--
	TOTAL		**21.5**	**18**	**0**	**11**	**195**	**505**	**700**

	Course Code	Course
#PE-II	B20EE3203	Power Electronic Drives
	B20EE3204	Electrical Distribution Systems
	B20EE3205	Digital Signal Processing
	B20EE3206	Soft Computing Techniques
#OE-II	Student has to study one Open Elective offered by AIDS or CE or CSBS or CSE or ECE or IT or ME or S&H from the list enclosed.	

***Note:** Gender Sensitization is a Self-Learning noncredit Audit Course

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3201	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

LOGIC DESIGN AND MICROPROCESSORS

(For EEE)

Course Objectives: Students will learn

1.	About various number systems, Boolean algebra, Logic gates.
2.	About the design of Combinational logic circuits.
3.	About the Flipflops and design of Sequential logic circuits
4.	The Architecture, functioning, Timing diagrams, instruction set of 8085 Microprocessor.
5.	The basics of interfacing peripherals with 8085 Microprocessor.

Course Outcomes: Students will be able to

S.No	Course Outcome	Knowledge Level
1.	**Explore** number systems, binary athematic and **apply** the Boolean algebra for simplifying the Boolean expressions.	K3
2.	**Design** of combinational logic circuits using K – maps.	K4
3.	**Implement** Flipflops using gatesand **design** synchronous counters and shift registers**.**	K4
4.	**Illustrate** the architecture of 8085 Microprocessor and its operation and timing diagrams.	K3
5.	**Interface** various I/O devices to 8085 Microprocessor using 8251, 8253, 8255, 8279 peripheral devices and A/D & D/A converters.	K4

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO DIGITAL LOGIC:** Binary numbers, Number base conversions, Octal and Hexadecimal numbers, Complements, Binary Codes, Boolean algebra, Basic Theorems and properties, Boolean functions, Simplification of Boolean expressions, Canonical and Standard forms, other logic operations, Digital Logic gates.
UNIT-II (10 Hrs)	**DESIGN OF COMBINATIONAL LOGIC CIRCUITS:** Simplification of Boolean expressions by Karnaugh Maps (up to four variable), Don't care condition, Sum of products (SOP) and Product of sums (POS) forms, AND-OR, OR-AND, NAND and NOR implementation, Design procedure, Half adder, Full adder and Parallel adder circuits, Decoder, Encoder, Multiplexer and De-Multiplexer.
UNIT-III (10 Hrs)	**DESIGN OF SEQUENTIAL LOGIC CIRCUITS:** Introduction, Flip flops – RS, D, JK and T logic diagrams, operations, characteristic

	and excitation tables, Master-Slave JK flip-flop, Sequential circuits design procedure, Synchronous binary counter, Shift register.
UNIT-IV (10 Hrs)	**8085 MICROPROCESSOR ARCHITECTURE and INSTRUCTION SET:** Functional block diagram of Intel 8085 Microprocessor, Register organization, address, data and control buses, pin configuration of 8085 and its description. Timing diagrams, Opcode fetch machine cycle, Memory Read and Write machine cycle and I/O Read and Write cycles, 8085 Instruction set, Addressing modes, Stack and subroutines.
UNIT-V (10 Hrs)	**INTERFACING PERIPHERALS:** Programmable peripheral interface (8255) - 8251 USART,8253/8254 Programmable timer, 8279 keyboard/display interfacing, D/A and A/D converters interfacing to the Microprocessor**.**
Text Books:	
1.	M. Morris Mano, Digital logic and computer design, Prentice-Hall of India Pvt. Limited, New Delhi, 2nd Edition. 2000.
2.	Ramesh S. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, Penram International Publishing, New Delhi, 5th edition, 2008.
Reference Books:	
1.	Frederick J. Hill and Gerald R. Peterson, Introduction to Switching Theory and Logic Design, John Wiley & sons, Inc. New York, 3rd edition, 1981.
2.	Douglas V.Hall, "Microprocessors and Interfacing", 2nd Revised Edition, TMH Publications. Design", 2nd ed., PHI

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3202	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

CONTROL SYSTEMS

(For EEE)

Course Objectives: Students will learn

1.	The modelling of linear systems using transfer functions and obtain transfer functions using block diagrams and signal flow graphs.
2.	The significance of time response and find it for system analysis in transient and steady state.
3.	The concept of stability and know different techniques of stability analysis.
4.	The concept of frequency domain analysis, Bode plots, Polar plots
5.	The concept of state space modeling and analysis.

Course Outcomes: Students will be able to

Sl.no	Outcome	Knowledge Level
1.	**Model** electrical and mechanical physical systems by **applying** laws of physics and **derive** transfer functions from block diagrams & Signal Flow Graphs.	K3, K4
2.	**Analyze** systems in time domain for transient and steady-state behavior.	K3, K4
3.	**Analyze** the stability of a system by RH criterion and Root locus.	K3, K4
4.	**Analyze** the behavior of system using frequency response plots.	K3, K4
5.	**Model** and **analyze** the LTI system using state space approach.	K3, K4

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO CONTROL SYSTEMS** Open loop and closed loop systems, Transfer Function models of linear Systems-Modelling of Electrical & mechanical Systems, Block Diagram representation of Control Systems – Block Diagram Reduction, Signal Flow Graph Representation of Control Systems, Mason's gain formula, Feedback Characteristics of Control Systems.
UNIT-II (10 Hrs)	**TIME DOMAIN ANALYSIS OF CONTROL SYSTEMS** Time Response of First and Second Order Systems with Standard Input Signals, Time Domain Specifications of Second Order Systems, Steady State Error, Steady State Error Constants-Basic Control Actions- Effects of Integral and Derivative Control actions.
UNIT-III (10 Hrs)	**STABILITY ANALYSIS OF CONTROL SYSTEMS** Concept of Stability, Routh-Hurwitz Criterion, Relative Stability Analysis, The Concept and Construction of Root Loci, Analysis of Control Systems with Root Locus.
UNIT-IV (10 Hrs)	**FREQUENCY DOMAIN ANALYSIS OF CONTROL SYSTEMS** Frequency Response -Bode Plots- Log Magnitude versus Phase Plots, Polar Plots –

	Frequency Domain specifications -Correlation between Time and Frequency Responses, Stability in Frequency Domain- Nyquist Stability Criterion - Assessment of Relative Stability, Gain Margin and Phase Margin.
UNIT-V (10 Hrs)	**STATE SPACE ANALYSIS** Concept of state, State Variables and State Models, State space models for LTI electrical Systems, Phase variable form and diagonal canonical form, Conversion between Transfer Function models and State space Models, Solution to the State Equation, State Transition Matrix, Concept of Controllability and Observability.
Text Books:	
1.	I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International Publishers (6^{th} Edition).
2.	Norman S.Nise, 'Control systems Engineering ', Wiley publications (7^{th} Edition)
Reference Books:	
1.	Katsuhiko Ogata, "Modern Control Engineering" PHI (4^{th} Edition).
2.	Richard C. Dorf and Robert H. Bishop, „Modern Control Systems", Addison-Wesley Publishers (8^{th} Edition)

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS3202	**HS**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

UNIVERSAL HUMAN VALUES-2 : UNDERSTANDING HARMONY

(Common to CE, ECE, & EEE)

Course Objectives: The objectives of this course are to make the student aware of

1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3	Strengthening of self-reflection.
4	Development of commitment and courage to act.

Course Outcomes:

S.No	Outcome	Knowledge Level
1	Students are expected to become more aware of themselves, and their surroundings (family, society, nature)	K2
2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.	K2
3	They would have better critical ability.	K2
4	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).	K2
5	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Course Introduction** - Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
UNIT-II (8Hrs)	**Understanding Harmony in the Human Being** - Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - happiness and physical facility

	Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail; Programs to ensure Sanyam and Health.
UNIT-III (8Hrs)	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship Understanding the meaning of Trust; Difference between intention and competence Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
UNIT-IV (8Hrs)	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence** Understanding the harmony in the Nature Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self regulation in nature Understanding Existence as Co-existence of mutually interacting units in all pervasive space Holistic perception of harmony at all levels of existence.
UNIT-V (8Hrs)	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
Text Books	
1	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
Reference Books:	
1	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3	The Story of Stuff (Book).
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher
6	Slow is Beautiful - Cecile Andrews
7	Economy of Permanence - J C Kumarappa
8	Bharat Mein Angreji Raj – Pandit Sunderlal
9	Rediscovering India - by Dharampal
10	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11	India Wins Freedom - Maulana Abdul Kalam Azad
12	Vivekananda - Romain Rolland (English)

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3203	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

POWER ELECTRONIC DRIVES

(For EEE)

Course Objectives: Students will learn

1.	About selection of Electric Drive and different Starting & Braking methods.
2.	About the dynamics of Drive with mechanical load characteristics and Four-Quadrant operation
3.	About various Speed control methods for rectifier fed DC Motors.
4.	About chopper fed DC Drives.
5.	About various types of Induction motor Drives with slip power recovery schemes.

Course Outcomes: Students will be able to

S.No	Outcome	Knowledge Level
1.	**Select** suitable converter for motor drives &**explore** different electric starting and braking methods.	K3, K4
2.	**Analyze** the dynamics of electric drive and **demonstrate** the operation of drive to meet the load requirements.	K3, K4
3.	**Apply** and **analyze** rectifier fed DC drives with continuous current mode operation.	K3, K4
4.	**Apply** and **analyze** chopper fed DC drives with closed loop control.	K3, K4
5.	**Investigate** the control strategies for Induction motor Drives and slip power recovery schemes.	K3, K4

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO ELECTRICAL DRIVES** Electrical Drive & its advantages, Parts of Electrical Drives – (Electrical Motors, Power Modulators, Sources and Control Unit), Choice of Electrical Drives, Status of DC and AC Drives, Electric Starting and Braking methods.
UNIT-II (10 Hrs)	**DYNAMICS OF ELECTRICAL DRIVES** Fundamental Torque Equation, Multi-Quadrant Operation of Drive, Equivalent values of Drive Parameters – Loads with Rotational motion & Translational motion, Components of Load Torques, Nature and Classification of Load Torques, Steady State Stability, Load Equalization.
UNIT-III (10 Hrs)	**CONTROLLED RECTIFIER FED DC DRIVES** DC Separately excited & Series motors – Speed - Torque relations & characteristics – Armature voltage, Flux and Armature Resistance control, Single-Phase Fully controlled converter fed DC Motors - Continuous current mode operation - Speed - Torque Characteristics – simple problems.

UNIT-IV (10 Hrs)	**CONTROLLED CHOPPER FED DC DRIVES** Choppers – four quadrant operation, Chopper controlled DC separately excited motor and DC series motor – Motoring, Regenerative Braking, Dynamic Braking – Speed-Torque Characteristics, Closed-Loop Control of DC Drive.
UNIT-V (10 Hrs)	**CONTROL OF INDUCTION MOTORS** Three - phase Induction Motor Speed-Torque relation & its characteristics, Speed control by AC Voltage Controller, Variable frequency control of an Induction motor (V/f control), Closed-Loop Speed control of Induction motor drive, Slip Power Recovery Schemes – Static Scherbius Drive & Static Kramer Drive.
Text Books:	
1.	Fundamentals of Electrical Drives by Gopal K. Dubey, Second Edition, 2001.
2.	Power Electronics: Circuits, Devices and Applications by M.H.Rashid, Third Edition, 2009.
Reference Books:	
1.	A First Course on Electrical Drives by S. K. Pillai, New Age, Third edition, 2012.
2.	Modern Power Electronics and AC Drives by Bimal K Bose, 2005.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3204	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

ELECTRICAL DISTRIBUTION SYSTEMS

(For EEE)

Course Objectives: Students will learn

1.	About the types of Loads and Load Characteristics
2.	The design considerations of primary and secondary distribution systems.
3.	To compute voltage drop and power loss in feeders and examine the power factor improvement and voltage control.
4.	About the substations and cables.
5.	About the protection of distribution systems.

Course Outcomes: Students will be able to

S. No	Outcome	Knowledge Level
1.	**Explore** the types of Loads and Load Characteristics	K3
2.	**Analyze** the design considerations of primary and secondary distribution systems	K4
3.	**Compute** voltage drop and power loss and **apply** capacitive compensation for power factor correction and voltage control in a distribution system	K3
4.	**Illustrate** types of substations and cables	K3
5.	**Apply** various protective devices and its coordination techniques to distribution system	K3

SYLLABUS

UNIT-I (10Hrs)	**LOAD CHARACTERISTICS AND LOAD MODELLING** Introduction to Distribution systems, Definitions, Loads and Load Characteristics, Load curves and Load- duration curves, Relation between Load and loss Factor, Load growth and Diversified Demands, Load Modeling, Load Growth and Forecasting.
UNIT-II (10Hrs)	**DISTRIBUTION NETWORKS** Introduction, Primary and Secondary Distribution, Feeder loading and voltage drop considerations, Voltage drop in feeder lines with different loadings, Voltage drop constant 'K' for feeders with different types of loadings, Feeder loading with Square-type Distribution system. Primary distribution system, Primary Feeder voltage Levels and Loading, Secondary Distribution Systems, Distribution feeders, Design Considerations.
UNIT-III (10Hrs)	**VOLTAGE DROP AND POWER LOSS CALCULATIONS** Introduction, DC 2-Wire Distribution System, DC 3-Wire System, AC Single-Phase and Three - Phase Distribution System, Voltage Drop Computation based on Load

	Density, Power-loss Estimation In Distribution System, **REACTIVE POWER COMPENSATION & APPLICATION OF CAPACITORS** Advantages and Benefits of Power Factor Improvement, Power-Factor Improvement Using Capacitors: Location of Capacitors, Voltage Improvement Achieved Using Capacitor Banks, Application of Capacitors for Power-Factor Improvement.
UNIT-IV (10Hrs)	**SUBSTATIONS AND CABLES** Introduction, Substation Types, Substation Components, Equipment and Layouts, Substation Location and Size, Grounding, Earth Connections and Earthing System, Gas Insulated Substation (GIS) Introduction of cables – construction and types – comparison of cables with overhead transmission lines.
UNIT-V (10Hrs)	**DISTRIBUTION SYSTEM PROTECTION:** Introduction, Basic Requirements of the protective system, over current Protection, Fuses, Circuit Breakers, Protective Relays and Relaying, Coordination Between Different Protective Devices, Protection Against Over voltages.

Text Books:	
1.	"Electrical Power Distribution Systems"- by V. Kamaraju, Tata Mc Graw-hill, 2012.
2.	"Electric Power Distribution system, Engineering"- 3rd Edition by TuranGonen, CRC Press, 2015.
Reference Books:	
1.	"Electrical Distribution Systems"- 2nd Edition by Dale R.Patrick and Stephen W.Fardo, CRC press, 2009.
2.	"Electric Power Distribution" - 4th Edition by A.S. Pabla, Tata Mc Graw–hill Publishing Company, 1997.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3205	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

DIGITAL SIGNAL PROCESSING

(For EEE)

Course Objectives: Students will learn

1.	The basic concepts and techniques for processing signals.
2.	About the DTFT, DFT and convolution of sequences.
3.	About the FFT algorithms
4.	About design techniques for IIR digital filters
5.	About design techniques for FIR digital filters and finite word length effects in signal processing

Course Outcomes: Students will be able to

S .No	Outcome	Knowledge Level
1.	**Apply** Sampling theorem to **analyze** the Discrete time signals, systems and realize digital filters.	K3, K4
2.	**Analyze** discrete signals in the frequency domain and **compute** the linear and circular convolutions of discrete sequences.	K4
3.	**Apply** FFT algorithms to find the DFT of Discrete sequence.	K3,K4
4.	**Design** the IIR filter by considering the given specifications.	K4
5.	**Design** the FIR filter by using window techniques and know the finite word length effects in FIR filter.	K4

SYLLABUS

UNIT-I (10 Hrs)	**DISCRETE - TIME SIGNALS AND SYSTEMS** Signal processing, Advantages, limitations and applications of DSP**.** Sampling and reconstruction of signals - aliasing; Sampling theorem and Nyquist rate; Discrete time signals, Sequences; Linear Shift – Invariant Systems, Linear Constant Coefficient Difference Equations, System Function H (Z), Stability, Structure and Realization of Digital Filters.
UNIT-II (10 Hrs)	**DISCRETE TIME FOURIER TRANSFORM (DTFT) & DISCRETE FOURIER TRANSFORM (DFT):** DTFT and its properties Representation of Periodic Sequences, Properties of DFS, DFT and its Properties. Convolution Of Sequences, Long Duration Sequence Filtering.
UNIT-III (10 Hrs)	**FAST – FOURIER TRANSFORMS (FFT):** Radix – 2 Decimation – In – Time (DIT) and Decimation – In – Frequency (DIF) FFT Algorithms, Radix – 2 Inverse DIT- FFT, Radix – 2 Inverse DIF FFT.

UNIT-IV (10 Hrs)	**IIR DIGITAL FILTER DESIGN TECHNIQUES:** General Considerations in Digital Filter Design. IIR Filter Design-Bilinear Transformation Method, Impulse Invariance Technique. Design of IIR Filters from Analog Filters (Butterworth Approximation Only). Frequency Transformations.
UNIT-V (10 Hrs)	**FIR DIGITAL FILTER DESIGN:** Linear Phase FIR filters, Fourier Series Method, Design of FIR Filter Using Windows (Rectangular, Bartlett, Hamming & Hamming Windows). Effect of finite register length in FIR filter design. Comparison of IIR and FIR Filters.

Text Books:	
1.	Alan V. Oppenheim & Ronald W. Schafer: Digital Signal Processing 1st Edition published by Pearson Education.
2.	J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms And Applications", Prentice Hall, 1997.
Reference Books:	
1.	P. Ramesh Babu:Digital Signal Processing ,4th Edition ,Scitech Publications.
2.	A. Anand Kumar, "Digital Signal Processing:2nd Edition, PHI Publications, 2015.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3206	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs**

SOFT COMPUTING TECHNIQUES

(For EEE)

Course Objectives: Students will learn

1.	The Need for Soft Computing Techniques in Engineering.
2.	About Fuzzy Logic and applications to Electrical Engineering problems.
3.	About Neural Networks to Various Forecasting Problems of Electrical Engineering
4.	About Genetic Algorithm to Find Optimal Solutions of Engineering Problems
5.	About Particle Swarm Optimization Algorithm to Find Optimal Solutions of Engineering Problems

Course Outcomes: Students will be able to

S. No	Outcomes	Knowledge Level
1.	**Examine** the Feasibility of Applying Soft Computing Techniques.	K3
2.	**Apply** Fuzzy Logic to **Design** Intelligent Controllers for Electrical Systems	K3, K4
3.	**Apply** Artificial Neural Networks to **Identify** Engineering Prediction Models	K3, K4
4.	**Apply** Genetic Algorithm to **Identify** Optimal Solutions of Engineering Problems	K3, K4
5.	**Apply** Particle Swarm Optimization to **Identify** Optimal Solutions of Engineering Problems	K3, K4

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO SOFT COMPUTING** Introduction to Soft Computing (SC), Artificial Intelligence (AI), Historical Background, Applications of Soft Computing and AI, Conventional Rule-based Systems versus Expert Systems and Knowledge-based Systems. Significance of Soft Computing-Linear Regression (LR) Mathematical Model with 'N' Data Points, Identification of LR Model with SC Techniques, Role of Soft Computing and AI in Engineering, Merits and Demerits of SC.
UNIT-II (10 Hrs)	**FUZZY LOGIC SYSTEM (FLS)** Introduction to Fuzzy, Historical Background of Fuzzy logic, Crisp Sets- Operations, Properties and Relations, Fuzzy Sets- Membership Functions, Basic Operations, Properties and Fuzzy Relations, Fuzzy System-Fuzzy Quantifiers, Fuzzy Inference and Defuzzification Methods, Fuzzy Rule-based Systems (IF-THEN), Application of Fuzzy Logic System for Basic Electrical DC Motor Control Problem.
UNIT-III (10 Hrs)	**ARTIFICIAL NEURAL NETWORKS (ANN)** Introduction to ANN, Biological Neural Networks, Framework of ANN-Terminology, Notation, Processing Units, Connections, Activation Functions and Output Rules.

	McCulloch-Pitts Neuron Model, Single Layer Neural Networks-Perceptron and ADALINE, Multilayer Neural Networks, Recurrent Neural Networks (Elementary Structures), Learning Methods-Back Propagation Algorithm, Application of ANN for Electrical Load Forecasting Problem
UNIT-IV (10 Hrs)	**GENETIC ALGORITHMS (GA)** Introduction to GA, Prerequisites-Objective Function, Constraints and Solution Search Space, Genetic Algorithm (GA)- Historical Background of GA, Working Principle, Encoding, Fitness Function, Reproduction, Crossover, Mutation and Convergence Criteria. Solution of Single Variable Unconstrained Problems using GA (Problems with Hand Calculations)
UNIT-V (10 Hrs)	**PARTICLE SWARM OPTIMIZATION (PSO)** Introduction to PSO, Population Search-based Algorithms-Overview, Terminology, Common Parameters of PSO-Population Size and Iterations, Control Parameters of PSO-Acceleration Coefficients and Inertia Weight. Updating Mechanisms of PSO, Convergence Criteria of PSO, Solution of Single Variable Unconstrained Problems using PSO (Problems with Hand Calculations)
Text Books:	
1.	Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publication, 2003
2.	Soft Computing with MATLAB Programming-N.P. Padhy, S.P. Simon. Oxford University Press, 2015.
Reference Books:	
1.	Introduction to Neural Networks using MATLAB 6.0 - S.N. Sivanandam, S. Sumathi, S.N. Deepa, TMH, 2006
2.	Intelligent Systems-Modelling, Optimization and Control, Yung C.Shin, C. Xu, CRC Press, 2008.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3207	**PC**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs**

CONTROL SYSTEMS LABORATORY

(For EEE)

Course Objectives: Students will learn

1.	To verify the time response of control system using MATLAB Software
2.	To draw Root Locus plot, bode plot and Nyquist plot using MATLAB software
3.	To use control system components found in practical control system
4.	To design state feedback controller using Pole placement technique.
5.	About analysis of systems in time domain and frequency domain.

Course Outcomes: Students will be able to

S. No	Outcomes	Knowledge Level
1	**Investigate** the time response of control system	K4
2	**Draw** the Torque speed characteristics of AC and DC Servo Motor.	K4
3.	**Analyze** the stability of a control system by generating Root locus, Bode and Nyquist plot.	K4
4.	**Investigate** the effect of PID Controller on system performance	K4
5.	**Explore** the performance of control system components	K4

SYLLABUS

	Part-A (MATLAB Simulation)
1	Time Response of 1st and 2nd order systems.
2	Stability analysis by Root-locus plot
3	Gain Margin and Phase Margin using Bode plot
4	Stability analysis by Nyquist plot
5	System analysis in state space
6	Design of a state feedback controller using Pole placement technique
7	PID Controller
	Part-B (Experimentation)
1	Time Response of 1st and 2nd order system.
2	Speed torque characteristics of DC Servo motor.
3	Frequency response of RC filter.
4	Speed torque characteristics of AC Servomotor.
5	PID Controller.
6	Synchro Transmitter and Receiver pair.
7	DC Position Control
	Add on experiments
1.	Speed control of DC Motor **(MATLAB Simulation)**
2.	Lag Lead Compensation **(Experimentation)**

Reference Books:	
1.	Benjamin C. Kuo, “Automatic Control Systems”, PHI (5th Edition)
2.	Katsuhiko Ogata, “Modern Control Engineering”, PHI (4th Edition)

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3208	**PC**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs**

LOGIC DESIGN AND MICROPROCESSORS LABORATORY

(For EEE)

Course Objectives: Students will learn

1.	To verify the logic gates and design of combinational logic circuits
2.	The design of Synchronous counters, shift registers, decoders using flip-flops.
3.	To write Assembly Language Program (ALP) using arthematic and logical instruction set of 8085 Microprocessor
4.	The programs to convert binary to Binary Coded Decimal (BCD) codes and sorting techniques.
5.	About interfacing peripheral devices with 8085 Microprocessor

Course Outcomes: Students will be able to

S. No	Outcome	Knowledge Level
1.	**Develop** Adders, Multiplexers, Encoders & Decoders using combinational logic circuits	K4
2.	**Design** Synchronous counters, shift registers using sequential logic circuits	K4
3.	**Develop** ALP to add8 - bit binary numbers, 2 - digit BCD numbers and pick largest & smallest numbers using 8085 Microprocessor	K4
4.	**Develop** ALP to convert binary to BCD numbers and sorting array of 8-bit binary numbers.	K4
5.	**Interface** different peripherals with 8085 Microprocessor	K4

SYLLABUS

PART-A: LOGIC DESIGN	
1	Verification of Logic Gates and Design of a combinational logic circuit using Digital Trainer Kit.
2	Implementation of Binary Adders using Digital Trainer Kit
3	Verify the logic functions of Digital Multiplexer using Digital Trainer Kit.
4	Design and Verify Synchronous Binary Counter using Digital Trainer Kit.
5	Verify the functioning of Shift Register using Digital Trainer Kit
6	Implementation of Encoder & Decoder using Digital Trainer Kit
PART-B: MICROPROCESSOR	
7	Program to add two 8-bit binary numbers
8	Program to add an array of 8-bit binary numbers.
9	Program to pick the largest even number from an array of 8- bit binary numbers
10	Program to find the sum of an array of 2- digit packed BCD numbers.
11	Program to convert an 8- bit binary number into BCD.
12	Program to sort given array of 8-bit binary numbers.

Add On Experiments	
13	Design of Ring Counter
14	Stepper Motor Interfacing
Reference Books:	
1.	M. Morris Mano, Digital Design, Prentice-Hall of India Pvt. Limited, New Delhi, 2nd Edition. 2000.
2.	Ramesh S. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, Penram International Publishing, New Delhi, 5th edition, 2008.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE3209	**PC**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs**

ELECTRICAL SYSTEM SIMULATION LABORATORY

(For EEE)

Course Objectives: Student will learn

1.	To write MATLAB programs for Y-bus formation, load flow, Economic Load Dispatch.
2.	To write MATLAB programs for obtaining Symmetrical components and fault analysis.
3.	To make SIMULINK models for solving swing equation and load frequency control of single area system
4.	About SIMULINK models for Rectifier, Inverter, Chopper, AC Voltage controller &Cycloconverter.
5.	About the functioning of PF correction & Effect of shading in PV array using PSCAD software.

Course Outcomes: Students will be able to

Sl.No	Outcome	Knowledge Level
1.	**Compute** the Y-bus and solve Gauss – Seidel (GS) load flow, Economic Load Dispatch using MATLAB Programming.	K4
2.	**Compute** the symmetrical components and LG, LLG fault currents using MATLAB Programming / SIMULINK.	K4
3.	**Construct** the model of swing equation for assessing transient stability, load frequency control of single area system using MATLAB/ SIMULINK software.	K4
4.	**Construct** the simulation models to **illustrate** the operation of Rectifier, Inverter, Chopper, AC Voltage controller and Cycloconverter using MATLAB/SIMULINK software.	K4
5.	**Construct** the various simulation models to **illustrate** the functioning of PF correction, Effect of shading in PV array and GS load flow using PSCAD and ETAP softwares.	K4

SYLLABUS

1	Y-bus formation by direct inspection method
2	Power flow solution by Gauss-seidel method using MATLAB
3	Economic load dispatch
4	Symmetrical components
5	LG & LLG Fault analysis
6	Transient stability using swing curve
7	Single Phase controlled & uncontrolled rectifier fed R & RL load
8	Three-phase SPWM (phase-shift) inverter with R load
9	DC-DC Boost converter (Chopper)

10	Single phase AC voltage controller with R & RL load
11	PF improvement of a lagging load using PSCAD software.
12	Effect of shading a single module in aphotovoltaic array using PSCAD software.
Add On Experiments	
13	Power flow solution by Gauss-seidel method using ETAP software
14	Automatic generation control in a Single area isolated power system
15	Single phase bridge type cycloconverter with R-Load
Reference Books:	
1.	Power System Analysis HaadiSaadat 2nd edition, McGraw-Hill College1998
2.	Power Electronics by Dr. P. S Bimbra, Khanna Publications, 3rd edition, reprint 2021

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS3203	**SOC**	**1**	**--**	**2**	**2**	**--**	**50**	**3Hrs.**

SOFT SKILLS

(Common to CE, EEE, & ME)

Course Objectives:

1.	To familiarize students with soft skills and how they influence their professional growth.
2.	To build/refine the professional qualities/skills necessary for a productive career and to instill Confidence through attitude building.

Course Outcomes: Students will be able to

S.No	Outcome	Knowledge Level
1	Apply soft skills in the workplace and build better personal and professional relationships making informed decisions.	K3
2	Participate in group discussions/group activities, exhibit team spirit, use language effectively according to the situation, respond to their interviewer/employer with a positive mind, make answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process.	K3

SYLLABUS

1.	Introduction to Soft Skills, Significance of Inter & Intra-Personal Communication
2.	SWOT Analysis, Creativity & Problem Solving
3.	LSRW, JAM, Presentation Skills
4.	Building a positive attitude, Leadership & Team Work
5.	Goal Setting – Guidelines for Goal Setting
6.	Group Discussion: Essential guidelines
7.	Telephone Etiquette, Telephonic Interview
8.	Resume Preparation: Common resume blunders, tips for betterment, Resume Review
9.	Employability Skills: Emotional Intelligence, Report Writing, Social Consciousness and Social Entrepreneurship, Stress Management.
10.	Awareness about Industry, Companies, Importance of researching the prospective workplace, Knowing about Selection Process
11.	Interview Skills: Types of Interviews, Mock Interview, Do's and Don'ts of Interview.

Text Books:

1	Soft Skills & Employability Skills by Samina Pillai and Agna Fernandez, Cambridge University Press India Pvt. Ltd.

2	Soft Skills, by Dr. K. Alex, S. Chand & Company Ltd., New Delhi
Reference Books:	
1	The Art of Public Speaking by Dale Carnegie
2	The Leader in You by Dale Carnegie
3	Emotional Intelligence by Daniel Golman
4	Stay Hungry Stay Foolish by Rashmi Bansal
5	I have a Dream by Rashmi Bansal.
Additional Materials	
1	https://www.youtube.com/watch?v=LTnI7cmpDZI
2	https://www.youtube.com/watch?v=ic5O2sxhH9M
3	https://www.youtube.com/watch?v=4ZQkYSpmOdU
4	https://www.youtube.com/watch?v=d8p-5WcXoRs
5	https://www.youtube.com/watch?v=yZOar04g4zk&t=94s

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS3204	**HS**	**2**	**--**	**--**	**--**	**--**	**--**	**--**

GENDER SENSITIZATION

(Common to ALL Branches)

Course Objectives:

1.	To develop students' sensibility with regard to issues of gender in contemporary India.
2.	To provide a critical perspective on the socialization of men and women.
3.	To introduce students to information about some key biological aspects of genders.
4.	To help students reflect critically on gender violence and workplace security.
5.	To expose students to more egalitarian interactions between men and women.

Course Outcomes: At the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1.	Understand the important issues relating to gender in contemporary India.	K2
2.	Get sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender.	K2
3.	Attain a finer grasp of how gender discrimination works in our society and how to counter it.	K2
4.	Acquire insight into the gendered division of labour and its relation to politics and economics.	K2
5.	Develop a sense of appreciation for both men and women in all walks of life.	K3

SYLLABUS

UNIT-I	**Understanding Gender and Related Concepts - Gender in Everyday Life** Introduction: Conceptual Connotation – Sex and Gender – Basic Gender Concepts - Gendered Socialization – Gender Stereotypes –Exploring Attitudes towards Gender – Gender Roles & Relationships - Myths – Gender in Indian society – Early days – Later Vedic Period –Medieval and British Period – Independent India.
UNIT-II	**Introduction to Gender Justice- Notion and Significance** Division and Valuation of Work – Housework- The Invisible Work - "My Mother doesn't work," - Offences against Women –Fact and Fiction - Status of Women in Society – Gender and Human Rights - Gender Equality – Gender Justice – Notion and Significance
UNIT-III	**International and Constitutional Perspectives on Gender Equality** The International Bill of Rights, 1979 –Declaration on the Elimination of Violence against women 1993 –The Rights of Women –Beijing Platform for Action 1995 – Constitutional Guarantees – Fundamental Rights – Equality.

UNIT-IV	**Gender and Culture** Gender and Film - Gender and Electronic Media – Gender and Advertisement – Gender and Popular Literature – Gender Issues - Gender-Sensitive Behaviour – Gender being Together as Equals.
UNIT-V	**Gender Violence- Within and Beyond** Violence – Gender Violence – Types of Gender Violence –Gender Violence in Indian Perspective – -Women Specific Legislations for the Elimination of Violence Within and Beyond.

Reference Books:

1.	"Towards A World Of Equals: A Bilingual Textbook on Gender" by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas, and Susie Tharu, Published by Telugu Akademi (2015).
2.	Ferber, Holcomb & Wentling, Sex, Gender & Sexuality: The New Basics, Oxford Univ. Press 2008.
3.	Flavia Agnes, Sudhir Chandra, Monmayee Basu, Women and Law in India, Oxford Univ. Press 2004.
4.	Mamta Rao, Law Relating to Women and Children, Eastern Book Co, Lucknow.
5.	K.I. Vibhute, Criminal Law, Lexis Nexis, 12th Edn.
6.	N. Prabha Unnithan (ed.), Crime & Justice in India, Sage Pub., 2013.
7.	Ritu Gupta, Sexual Harassment at Workplace, Lexis Nexis, 2013.
8.	IGNOU: Gender Sensitization: Society, Culture and Change (2019) BGSE001, New Delhi IGNOU.

Web links:

1.	https://nptel.ac.in/courses/110105080
2.	https://www.youtube.com/watch?v=2Xfp2eiTte0
3.	https://www.youtube.com/watch?v=-FCEBe5VNcA&t=41s
4.	https://www.youtube.com/watch?v=7n9IOH0NvyY
5.	https://www.youtube.com/watch?v=dpC2jGqu4G0
6.	https://www.youtube.com/watch?v=kcW4ABcY3zI&t=99s
7.	https://www.youtube.com/watch?v=dlXw1PbnWKM
8.	https://www.youtube.com/watch?v=9bayaZ18_po
9.	https://www.youtube.com/watch?v=ZbLq23cGFV4&t=1662s
10.	https://www.youtube.com/watch?v=61aYvb0Vo68
11.	https://www.youtube.com/watch?v=728H4Khf7Gk&t=1793s
12.	https://www.youtube.com/watch?v=y2Yk-rSZ7PI
13.	https://www.youtube.com/watch?v=wSqFvcjDpos
14.	https://www.youtube.com/watch?v=AljDd7nj9wE
15.	https://www.youtube.com/watch?v=MKPM0f2fOjM