St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

SEMESTER – I

S. No.	Course codes	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	25G3D54101	Switched Mode Power Converters	PC	3	0	0	3
2.	25G3D54102	Machine Modelling and Analysis	PC	3	0	0	3
3.	25G3D49103a 25G3D49103b 25G3D54103b	**Program Elective – I** DC Drives Modern Control Theory Energy Auditing and Management	PE	3	0	0	3
4.	25G3D54104a 25G3D54104b 25G3D49104b	**Program Elective – II** Solar Energy Conversion Systems Wind Energy Conversion Systems Smart Grid Technologies	PE	3	0	0	3
5.	25G3D54105	Power Electronics Lab	PC	0	0	4	2
6.	25G3D49105	Renewable Energy Sources Lab	PC	0	0	4	2
7.	25G3DRM101	**Research Methodology and IPR**	**MC**	**2**	**0**	**0**	**2**
8.	25G3D54103a	**Skill Enhancement Course** AI Techniques in Electrical Engineering	SE	2	0	0	2
9.	25G3DAC101a 25G3DAC101b 25G3DAC101c	**Audit Course – I** English for Research Paper Writing Disaster Management Sanskrit For Technical Knowledge	AC	2	0	0	0
Total							**20**

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COURSE STRUCTURE & SYLLABUS

SEMESTER – II

S. No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	25G3D54201	Advanced Power Electronics	PC	3	0	0	3
2.	25G3D49202	FACTS Controllers	PC	3	0	0	3
3.	25G3D54202a 25G3D54202b 25G3D54202c	**Program Elective – III** AC Drives Advanced Power Semiconductor Devices & Protection Applications of Power Converters	PE	3	0	0	3
4.	25G3D49204a 25G3D49205a 25G3D54203b	**Program Elective – IV** Power Quality EV Charging Infrastructure & Technology Digital Signal Processors and applications	PE	3	0	0	3
5.	25G3D54204	Electric Drives Lab	PC	0	0	4	2
6.	25G3D49206	FACTS Devices & Simulation Lab	PC	0	0	4	2
7.	25G3DRM201	**Quantum Technologies and Applications**	MC	2	0	0	2
8.	25G3DPC201	**Comprehensive Viva Voce**	PC	0	0	0	2
9.	25G3DAC201a 25G3DAC201b 25G3DAC201c	**Audit Course – II** Pedagogy Studies Stress Management for Yoga Personality Development through Life Enlightenment Skills	AC	2	0	0	0
Total							**20**

****Students have to undergo an Industry Internship after I Year II Semester for a duration of 6 to 8 weeks**

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	SWITCHED MODE POWER CONVERTERS	L	T	P	C
25G3D54101		3	0	0	3
	Semester	**I**			

Course Objectives: To make the student

- Remember and Understand the concept of advanced converter topologies.
- Apply the concept of topologies for various switching regulators.
- Analyze the working and waveforms of the converters designed.
- Evaluate the operation of converters in continuous and discontinuous modes.

Course Outcomes (CO): Student will be able to

- Remember and understand the concept of Buck and Boost switching regulator topologies push-pull & forward converter, voltage & current fed topologies.
- Apply the concept of topologies for various switching regulators.
- Analyze the concepts of half & full bridge converter topologies.
- Evaluate the operation of continuous and dis-continuous Flyback converter topologies.

UNIT - I	FUNDAMENTAL SWITCHING REGULATORS –BUCK AND BOOST TOPOLOGIES	Lec Hrs: 9

Buck Switching Regulator Topology: Basic Operation - Significant Current waveforms -Buck regulator efficiency-Design relations of output filter inductor and capacitor. Boost Switching Regulator Topology: Basic Operation – Quantitative relations –Discontinuous and Continuous modes -Design relations.

UNIT - II	PUSH-PULL AND FORWARD CONVERTER TOPOLOGIES	Lec Hrs: 10

Push-Pull Topology: Basic Operation – Master/slave outputs - Flux imbalance -Power transformer design relations - Primary, secondary peak and RMS currents - output power and input voltage limitations - output filter design relations. Forward Converter Topology: Basic operation -Design relations - Slave output voltages -secondary load -free-wheeling diode and inductor currents. Forward converter with unequal power and reset winding turns - power transformer design and output filter design.

UNIT - III	HALF AND FULL BRIDGE CONVERTER TOPOLOGIES	Lec Hrs: 10

Half Bridge Converter Topology: Basic operation -Half bridge magnetic-output filter calculations, blocking capacitor to avoid flux imbalance- Half bridge leakage inductance problems. Full Bridge Converter Topology: Basic Operation-Full Bridge magnetic –out put filter calculations – transformer primary blocking capacitor.

UNIT - IV	FLYBACK CONVERTER TOPOLOGIES	Lec Hrs: 10

Discontinuous-Mode Fly backs: Basic operation - relation between output voltage versus input voltage-on time output load - design relations and sequential decision requirements –fly back converter, disadvantages. Continuous Mode Fly backs: Basic operation - Discontinuous mode to continuous mode transition - design relations– continuous mode fly backs.

UNIT - V	VOLTAGE-FED AND CURRENT- FED TOPOLOGIES	Lec Hrs: 9

Definitions-deficiencies of voltage fed pulse width modulated full wave bridge-buck voltage fed full wave bridge topology – basic operation buck voltage fed full wave bridge– advantages-drawbacks in buck voltage fed full wave bridge - buck current fed full wave bridge topology – basic operation – fly back current fed push pull topology.

Textbooks:

1. Pressman A. I, Switching Power Supply Design, McGraw Hill,3rd edition,2009.
2. Mitchell D. M, DC-DC Switching Regulator Analysis, Mc Graw Hill, 1st edition, 1988

Reference Books:

1. Ned Mohan, Power Electronics, JohnWiley,3rd edition,2011.
2. Otmar Kingenstein, Switched Mode Power Supplies in Practice, John Wiley, 1st edition,1991.

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

3. Billings K.H., Handbook of Switched Mode Power Supplies, McGrawHill, 3rd edition, 2010.
4. Nave M.J, Power Line Filter Design for Switched- Mode Power Supplies, Mark Nave Consultants, 2nd edition, 2010.

Online Learning Resources:

1. https://ee.iisc.ac.in/wp-content/uploads/2023/01/SMPC_VRamnarayanan.pdf
2. http://acl.digimat.in/nptel/courses/video/108108036/lec1.pdf

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	MACHINE MODELLING & ANALYSIS	L	T	P	C
25G3D54102		3	0	0	3
	Semester	**I**			

Course Objectives: To make the student

- Understand the basic principles for machine analysis and reference frame theory.
- Apply the concept of Change of Variables, and Transformation to an Arbitrary Reference Frame.
- Analyze the dynamic analysis of machines.
- Design the modelling of machines.

Course Outcomes (CO): Student will be able to

- Understand the Concept Magnetically Coupled Circuits, Types of DC machines, Commonly used Reference Frames, machines variables, Time domain and state equations, Permanent Magnet Brushless DC Motor Operating principle.
- Apply the concept of Change of Variables and Transformation to an Arbitrary Reference Frame, Equal Area Criteria.
- Analyze the Free Acceleration Characteristics viewed from Various Reference Frames, Steady-State Analysis and its Operation, dynamic analysis of machines, Mathematical modelling of PM Brushless DC motor.
- Design the modelling of DC machines, Three phase Induction machines, Synchronous machine.

UNIT - I	BASIC PRINCIPLES AND ANALYSIS OF DC MACHINES	Lec Hrs: 10

Basic Principles for Machine Analysis:
Magnetically coupled circuits - Machine windings - Air-Gap MMF-Winding inductances - Voltage equations.

Modelling and Analysis of DC Machines:
Elementary theory of DC Machine - Voltage and Torque Equations- Types of DC Machines - Permanent and Shunt DC Motors - Time-Domain and State-Equations.

UNIT - II	REFERENCE FRAME THEORY	Lec Hrs: 9

Fundamentals of Transformations - Equations of Transformations - Change of Variables and Transformation to an Arbitrary Reference Frame - Commonly used Reference Frames - Transformation between Reference Frames - Steady-State Phasor Relationships and Voltage Equations

UNIT - III	MODELLING & DYNAMIC ANALYSIS OF THREE PHASE INDUCTION MACHINES	Lec Hrs: 10

Voltage and Torque Equations in Machine Variables - Voltage and Torque Equations in Arbitrary Reference Frame - Steady-State Analysis and its Operation.
Free Acceleration Characteristics viewed from Various Reference Frames - Dynamic Performance during Sudden Changes in Load Torque - Dynamic Performance during A Three-Phase Fault at the Machine Terminals.

UNIT - IV	MODELLING & DYNAMIC ANALYSIS OF SYNCHRONOUS MACHINES	Lec Hrs: 10

Voltage in Machine Variables - Torque equation in Machine Variables - Voltage Equations in Arbitrary and Rotor Reference Frame - Torque Equations in Substitute Variable- Steady-State Analysis and its Operation. Dynamic Performance of Synchronous Machine - Three-Phase Fault, Comparison of Actual and Approximate Transient Torque Characteristics - Equal Area Criteria.

UNIT - V	MODELLING OF SPECIAL MACHINES	Lec Hrs: 9

Modelling of Permanent Magnet Brushless DC Motor - Operating principle – Mathematical modelling of PM Brushless DC motor - PMDC Motor Drive Scheme.

Textbooks:

1. PaulC. Krause, Oleg Wasyzczuk, Scott S, Sudhoff, “Analysis of Electric Machinery and Drive Systems”, IEEE Press, 3rd Edition, 2013.

2. R. Krishnan, "Electric Motor Drives, Modeling, Analysis and Control" , Pearson Education India, 4th edition, 2015.

Reference Books:

1. P. C. Krause, "Analysis of Electric Machinery", McGraw Hill, 3rd edition, 2013
2. Samuel Seely, "Electro mechanical Energy Conversion", Tata Mc Graw Hill Publishing Company, 1st edition, 1962.
3. A.E, Fitzgerald, Charles Kingsley, Jr, and Stephan D ,Uman x, "Electric Machinery" ,Tata Mc Graw Hill, 7thEdition, 2020.
4. P. Kundur, "Power System Stability and Control", MC Graw Hill Education, 1st edition, 2006.

Online Learning Resources:

1. https://nptel.ac.in/courses/108106023
2. https://www.youtube.com/watch?v=2R4qaiRXvmM

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	DC DRIVES (PE-I)	L	T	P	C
25G3D49103a		3	0	0	3
	Semester	**I**			

Course Objectives: To make the student

- Understand the concept of separately excited single phase and three phase rectifier with DC Motor load drives.
- Apply various controlling techniques on DC motor Drives.
- Analyze the operations when various controlling techniques are applied on DC motor drives.
- Design of chopper controlled DC motor Drives working in different Quadrants

Course Outcomes (CO): Student will be able to

- Remember and understand the concept Separately excited single phase and three phase rectifier with DC Motor load drives.
- Apply the concept of phase controlled technique for DC motor Drives.
- Analyse the current and speed controlled Drives.
- Design of chopper controlled DC motor Drives in various quadrants.

UNIT - I	CONTROLLED BRIDGE RECTIFIER (1-Φ& 3-Φ) WITH DC MOTOR LOAD	Lec Hrs: 10

Separately excited DC motors with rectified single phase supply-single phase semi converter and single phase full converter for continuous and discontinuous modes of operation–power and power factor.

Three phase semi converter and three phase full converter for continuous and discontinuous modes of operation–power and power factor– Addition of Freewheeling diode.

UNIT - II	THREE PHASE NATURALLY COMMUTATED BRIDGE CIRCUIT AS A RECTIFIER OR AS AN INVERTER	Lec Hrs: 9

Three phase-controlled bridge rectifiers with passive load impedance - resistive load and ideal supply – Highly inductive load and ideal supply for load side and supply side quantities - shunt capacitor compensation – three phase-controlled bridge rectifier inverter.

UNIT - III	PHASE CONTROLLED DC MOTOR DRIVES	Lec Hrs: 9

Three phase-controlled converter - control circuit - control modelling of three phase converter – Steady state analysis of three phase converter control DC motor drive – Two quadrant, three phase converter-controlled DC motor drive – DC motor and load, converter.

UNIT - IV	CURRENT AND SPEED CONTROLLED DC MOTOR DRIVES	Lec Hrs: 10

Current and Speed controllers -current and speed feedback — Design of controllers - Current and Speed controllers – Motor equations– Filter in the speed feedback loop speed controller–current reference generator – current controller and flow chart for simulation – Harmonics and associated problems– sixth harmonics torque.

UNIT - V	CHOPPER CONTROLLED DC MOTOR DRIVES	Lec Hrs: 10

Principle of operation of the chopper– Four quadrant chopper circuit–Chopper for inversion –Chopper with other power devices – model of the chopper –input to the chopper – Steady state analysis of chopper-controlled DC motor drives –rating of the devices– Pulsating torque – Closed loop operation of DC motor Drives - Speed controlled drive system – current control loop – pulse width modulated current controller – hysteresis current controller– modelling of current controller– design of current

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Textbooks:
1. Fundamentals of Electric Drives –G.K. Dubey– Narosa Publications -2nd edition, 2020. 2. Power Semiconductor drives–S.B. Dewanand, A. Straughen –Wiley India edition-1st edition, 2009.
Reference Books:
1. Power Electronics and motor control–Shepherd, Hulley, Liang, CU Press, 2nd edition 1995 2. Electric motor drives modeling, Analysis and control –R. Krishnan, PHI, 5th edition, 2015 3. Power Electronic Circuits, Devices and Applications-M. H. Rashid, PHI, 4thedition, 2017
Online Learning Resources:
1. https://sravivarman.com/course/power-electronic-control-of-dc-drives/ 2. https://nptel.ac.in/courses/108108077

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	MODERN CONTROL THEORY	L	T	P	C
25G3D49103b	(PE-I)	3	0	0	3
	Semester	I			

Course Objectives: To make the student

- Remember and understand the concept of state space representation, Solution of state equation, STM, linearization of nonlinear systems, controllability and observability concepts, principles of duality, concepts of optimal and Lyapunov stability.
- Apply the above concepts to analyze controllability, Observability and pole placement by state feedback
- Analyze the concept of regulator, stability and sensitivity using various methods and disturbance rejection
- Design Full order observer and reduced order observer.

Course Outcomes (CO): Student will be able to

- Understand the state space representation, controllability and observability concepts, principles of duality, concepts of optimal and Lyapunov stability.
- Apply the state equations, pole placement by state feedback.
- Analyze controllability & observability of state models.
- Design full order observer and reduced order observer.

UNIT - I	STATE VARIABLE DESCRIPTION	Lecture Hrs: 10

Introductory matrix algebra and linear Vector Space, State space representation of systems- Linearization of a non-linear System- Solution of state equations- Evaluation of State Transition Matrix (STM).

UNIT - II	TRANSFORMATION, POLEPLACEMENT AND CONTROLLABILITY	Lecture Hrs: 8

Similarity transformation and invariance of system properties due to similarity transformations. Minimal realization of SISO, SIMO and MISO transfer functions. Discretization of a continuous time state space model- Conversion of state space model to transfer function model using Fadeeva algorithm- Fundamental theorem of feedback control - Controllability and Controllable canonical form - Pole assignment by state feedback using Ackermann's formula– Eigen structure assignment problem.

UNIT - III	OPTIMAL CONTROL	Lecture Hrs: 10

Linear Quadratic Regulator (LQR) problem and solution of algebraic Riccati equation using Eigen value and Eigen vector methods- iterative method- Controller design using output feedback.

UNIT - IV	OBSERVERS	Lecture Hrs:10

Observability and observable canonical form-Design of full order observer using Ackermann's formula -Bass Gura algorithm- Duality between controllability and observability- Full order Observer based controller design- Reduced order observer design.

UNIT - V	STABILITY ANALYSIS AND SENSITIVITY	Lecture Hrs:10

Internal stability of a system- Stability in the sense of Lyapunov- Asymptotic stability of linear time invariant continuous and discrete time systems- Solution of Lyapunov type equation- Model decomposition and decoupling by state feedback- Disturbance rejection- sensitivity and complementary sensitivity functions.

Textbooks:

1. K. Ogata, "Modern Control Engineering", Prentice Hall, India, 5th edition, 2010.
2. T. Kailath, "Linear Systems", Prentice Hall, 2016.
3. N.K. Sinha, "Control Systems", New Age International, 4th edition, 2013.

Reference Books:

1. Panos J Antsaklis, and Anthony N. Michel, "Linear Systems", New-age international (P) LTD. Publishers, 2009.
2. John JD Azzoand C. H. Houpis, "Linear Control System Analysis and Design conventional and Modern", Mc Graw- Hill Book Company, 3rd edition, 1988.
3. B.N. Dutta, "Numerical Methods for linear Control Systems", Elsevier Publication, 2007.

4. C.T. Chen "Linear System Theory and Design-PHI, India,1984.
5. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", 11th Edition, Pearson Edu., India, 2009

Online Learning Resources:

1. http://www.digimat.in/nptel/courses/video/108103007/L01.html

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	ENERGY AUDITING AND MANAGEMENT (PE-I)	L	T	P	C
25G3D54103b		3	0	0	3
	Semester	**I**			

Course Objectives: To make the student

- To understand the current energy scenario and importance of energy conservation.
- To acquire the knowledge about different energy efficient devices.
- To measure thermal efficiency and other renewable resources.
- To design suitable energy monitoring system to analyze and optimize the energy consumption in an electrical system.

Course Outcomes (CO): Student will be able to

- Understand the current energy scenario and importance of energy conservation.
- Acquire the knowledge about different energy efficient devices.
- Measure efficiency in renewable energy resources.
- Identify the equipment and areas of a system where energy conservation and Audit is necessary.

UNIT - I	ENERGY AUDIT AND DEMAND SIDE MANAGEMENT (DSM) IN POWER UTILITIES	Lecture Hrs: 10

Energy Scenario & Conservation -Demand Forecasting Techniques- Integrated Optimal Strategy for Reduction of T&D Losses - DSM Techniques and Methodologies- Loss Reduction in Primary and Secondary Distribution system and capacitors - Energy Management — Role of Energy Managers – Energy Audit-Metering.

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UNIT - II	ENERGY AUDIT	Lecture Hrs: 9

Energy audit concepts - Basic elements and measurements - Mass and energy balances - Scope of energy auditing in industries - Evaluation of energy conserving opportunities and environmental management - Preparation and presentation of energy audit reports - case studies and potential energy savings.

UNIT - III	INSTRUMENTATION	Lecture Hrs: 10

General Audit Instrumentation –Measuring building losses – Applications of IR thermo graphy – Measurement of electrical system performance – Measurement of heating, ventilation, air conditioning system performance – Measurement of combustion systems.

UNIT - IV	ENERGY CONSERVATION	Lecture Hrs:10

Energy conservation in HVAC systems and thermal power plants, Solar systems, Fan and Lighting Systems - Different light sources and luminous efficiency

UNIT - V	ECONOMIC EVALUATION OF ENERGY CONSERVATION	Lecture Hrs:9

Energy conservation in electrical devices and systems - Economic evaluation of energy conservation measures - Electric motors and transformers - Inverters and UPS - Voltage stabilizers.

Textbooks:

1. Frank kreith and D. Yogi goswamy / Editors, “Energy Management and conservation handbook”. NewYork,2008.
2. WC Turner: Energy Management Handbook, Seventh Edition, (Fairmont Press Inc., 2007)
3. YP Abbi and Shashank Jain: Handbook on Energy Audit and Environment Management, (TERI Press, 2006)

Reference Books:

1. Albert Thumann, and William J. Younger, “Handbook of Energy Audits”, Marcel Dekker, Inc., New york, 6th edition, 2003.

2. D.A. Reay, Industrial Energy Conservation-Pergamon Press, 1980.
3. T.L. Boten, Liptak B.G.,(Ed)Instrument Engineers Handbook, Chinton Book Company, 2004.
4. Hodge B.K, Analysis and Design of Energy Systems, Prentice Hall, 2002.
5. Larry C. Witte, Schmidt & Brown, Industrial energy management and utilization. Hemisphere publishing, Co.NewYork,1988.

Online Learning Resources:

1. https://onlinecourses.swayam2.ac.in/nou23_es05/preview
2. https://onlinecourses.nptel.ac.in/noc25_ar10/preview

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	SOLAR ENERGY CONVERSION SYSTEMS (PE–II)	L	T	P	C
25G3D54104a		3	0	0	3
	Semester	**I**			

Course Objectives: To make the student

- Understand the fundamentals of solar cell.
- Apply the photovoltaic systems and various technologies of solar PV cells, about manufacture, sizing and operating techniques.
- Analyze Series and parallel connection of cells, Hot spots in the module, Algorithms for MPPT.
- Design Solar cells and PV system.

Course Outcomes (CO): Student will be able to

- Understand the fundamentals of solar cell, Solar PV Modules from solar cells, system types, Standalone PV system configuration, Maximum Power Point tracking (MPPT).
- Apply the concept of various technologies of solar PV cells, manufacture, sizing and operating techniques.
- Analyze the concept of Effect of series and shunt resistance on efficiency, Effect of solar radiation on efficiency, Analytical techniques, Hot spots in the module, Algorithms for MPPT.
- Design of PV powered DC fan without battery, Standalone system with DC load using MPPT, PV powered DC pump, standalone system with battery and AC/DC load.

UNIT - I	SOLAR CELL FUNDAMENTALS	Lec Hrs: 9

Introduction to solar PV system, history of photovoltaics, photovoltaic effect, photovoltaic cell, PV Cell Material, equivalent circuit, electrical characteristics, PV terminology, maximum power point tracking.

UNIT - II	PARTIAL SHADING	Lec Hrs: 10

Partial shading of PV arrays, causes, effect of partial shading on PV power, hot spots, bypass diode, PV characteristics, interconnection schemes, series and parallel connection, total cross tied (TCT), honey comb (HC), bridge linked (BL), reconfiguration techniques, electrical array reconfiguration techniques, Su Do Ku based reconfiguration technique.

UNIT - III	MPPT	Lec Hrs: 10

Maximum power point tracking algorithm, direct methods, differentiation method, feedback voltage or current method, perturb and observe method, incremental conductance method, parasitic capacitance method, indirect methods, curve fitting method, look up table method, open circuit voltage sensing method, short circuit current sensing method, artificial intelligence techniques, artificial neural network, fuzzy logic, genetic algorithm, algorithm for non-uniform insulation conditions, Fibonacci search method, short current pulse method, two stage method.

UNIT - IV	CONVERTER AND INVERTER OPERATIONS	Lec Hrs: 9

Buck converter, boost converter, buck boost converter, CUK converter, SEPIC converter, charge controller, shunt controller, series controller, inverters, inverter operation, power quality standards, grid interconnection techniques.

UNIT - V	PV SYSTEM DESIGN AND APPLICATIONS	Lec Hrs: 10

Design of PV powered DC fan without battery- Standalone system with DC load using MPPT- Design of PV powered DC pump- Design of standalone system with battery and AC/DC load – Wire sizing in PV system – Precise sizing of PV systems – Hybrid PV systems –Grid connected PV systems, Rooftop Systems.

Textbooks:

1. Chetan Singh Solangi, 'Solar Photovoltaics-Fundamentals, Technologies and Applications', PHI Learning Pvt Ltd, Delhi,2011.
2. Van Over straeton and Metens R.P,. 'Physics, Technology and use of Photovoltaics', Adam Hilger, Bristol, 1996.

Reference Books:

1. Konrad Mertens, 'Photovoltaics Fundamentals technology and Practice', Wiley publications 2014.
2. Chetan Singh Solangi, 'Solar Photovoltaics Technology and Systems', 2013.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc20_ph14/preview
2. https://nptel.ac.in/courses/117108141
3. https://nptel.ac.in/courses/108105066
4. https://nptel.ac.in/courses/115103123

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	WIND ENERGY CONVERSION SYSTEMS (PE-II)	L	T	P	C
25G3D54104b		3	0	0	3
	Semester	**I**			

Course Objectives: To make the student

- To Understand the application of wind energy and wind energy conversion system.
- To Design wind turbine blades and know about applications of wind energy for water pumping and electricity generation.
- To apply the concepts of fixed speed and variable speed ,wind energy conversion systems.
- To analyze the grid integration issues.

Course Outcomes (CO): Student will be able to

- Understand the concepts of fixed speed and variable speed wind energy conversion systems.
- Analyze the grid integration issues.
- Apply variable speed turbines for wind generation.
- Design and control principles of wind turbine.

UNIT - I	FUNDAMENTALS OF WIND TURBINES	Lec Hrs: 10

Historical background - Basics of mechanical to electrical energy conversion in wind energy -Types of wind energy conversion devices – Definition - Solidity, tip speed ratio, power coefficient, wind turbine ratings and specifications- Aerodynamics of wind rotors - Design of the wind turbine rotor.

UNIT - II	WIND TURBINE CONTROL SYSTEMS & SITE ANALYSIS	Lec Hrs: 9

Wind Turbine-Torque speed characteristics-Pitch angle control –Stall control –Power electronic control – Yaw control – Control strategy – Wind speed measurements – Wind speed statistics –Site and turbine selection.

UNIT - III	BASICS OF INDUCTION AND SYNCHRONOUS MACHINES	Lec Hrs: 10

The Induction Machine – Constructional features - Equivalent circuit model- Performance characteristics - Saturation characteristics – Dynamic d-q model – The wound field synchronous machine – The permanent magnet synchronous machine – Power flow between two synchronous sources – Induction generator versus synchronous generator.

UNIT - IV	GRID CONNECTED AND SELF-EXCITED INDUCTION GENERATOR OPEARTION	Lec Hrs: 10

Constant voltage, constant frequency- Single output system –Double output system with current converter & voltage source inverter–Equivalent circuits–Reactive power and harmonics- Reactive power compensation–variable voltage, variable frequency–The self-excitation process–Circuit model for the self-excited induction generator–Analysis of steady state operation–The excitation requirement–Effect of a wind generator on the network.

UNIT - V	WIND GENERATION WITH VARIABLE- SPEED TURBINES AND APPLICATION	Lec Hrs: 9

Classification of schemes–Operating area–Induction generators–Doubly fed induction generator – Wound field synchronous generator – The permanent magnet generator – Merits and limitations of wind energy conversion systems – Application in hybrid energy systems – Diesel generator and photo voltaic systems – Wind photovoltaic systems.

Textbooks:

1. S.N. Bhadra, D. Kastha, S. Banerjee, “wind electrical systems”, Oxford University Press, 1st edition, 2005.
2. Banshi D. Shukla, “Engineering of Wind Energy”, Jain Brothers, 1st edition, 2018

Reference Books:

1. S. Rao & B.B. Parulekar, “Energy Technology”, Khanna publishers, 4th edition, 2005.
2. N.K. Bansal, M. Kleemann, Michael Meliss, Renewable Energy sources & Conversion Technology,

Tata Mcgraw Hill Publishers & Co., 1st edition, 1990
Online Learning Resources:
1. https://onlinecourses.nptel.ac.in/noc25_ae12/preview 2. https://onlinecourses.nptel.ac.in/noc21_ee24/preview

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	**SMART GRID TECHNOLOGIES**	**L**	**T**	**P**	**C**
25G3D49104b	**(PE-II)**	**3**	**0**	**0**	**3**
	Semester	**I**			

Course Objectives: To make the student

- To know the importance of smart grid technology functions over the present grid.
- To get the knowledge about the measurement system and communication technology of Smart grid.
- To enhance the quality, efficiency and security of power supply.
- To impart an understanding of economics, policies and technical regulations for DG integration.

Course Outcomes (CO): Student will be able to

- Understand the importance of smart grid technology functions over the present grid.
- Apply the knowledge about the measurement system and communication technology of Smart grid.
- Determine the quality, efficiency and security of power supply.
- Impart an understanding of economics, policies and technical regulations for DG integration.

UNIT – I	**SMART GRIDS**	Lecture Hrs: 08

Smart grid overview- ageing assets and lack of circuit capacity- thermal constraints, operational constraints, security of supply- national initiatives- early smart grid initiatives- active distribution networks- virtual power plant- other initiatives and demonstrations- overview of the technologies required for the smart grid.

UNIT – II	**TRANSMISSION AND DISTRIBUTION MANAGEMENT**	Lecture Hrs: 10

Data Sources- Energy Management System-Wide Area Applications, Visualization Techniques- Data Sources and Associated External Systems- SCADA- Customer Information System- Modeling and Analysis Tools, Distribution System Modeling- Topology Analysis- Load Forecasting- Power Flow Analysis- Fault Calculations- State Estimation- Applications-System Monitoring- Operation- Management- Outage Management System- Overview of energy storage technologies.

UNIT - III	**SMART METERING AND DEMAND SIDE INTEGRATION**	Lecture Hrs: 10

Overview- Smart metering – Evolution of electricity metering- key components of smart metering- smart meters: an overview of the hardware used – signal acquisition- signal conditioning-analogue to digital conversion-computation-input/output and communication. Communication infrastructure and protocols for smart metering - Home area network, Neighborhood Area Network- Data Concentrator- meter data management system- Protocols for communication. Demand Side Integration- Services Provided by DSI-Implementation of DSI- Hardware Support- Flexibility Delivered by consumers from the Demand Side- System Support from DSI.

UNIT – IV	**COMMUNICATION TECHNOLOGIES FOR THE SMART GRID**	Lecture Hrs: 10

Data Communications: Dedicated and Shared Communication Channels, Switching Techniques, Circuit Switching, Message Switching, Packet Switching- Communication Channels, Introduction to TCP/IP.
Communication Technologies: IEEE 802 Series- Mobile Communications- Multi-Protocol Label Switching- Power line Communication.

UNIT – V	**INFORMATION SECURITY FOR THE SMART GRID**	Lecture Hrs: 10

Overview- Encryption and Decryption, Symmetric Key Encryption- Public Key Encryption- Authentication- Authentication Based on Shared Secret Key- Authentication Based on Key Distribution Center- Digital Signatures- Secret Key Signature-Public Key Signature- Message Digest.

Textbooks:

1. Janaka Ekanayake, Kithsiri Liyanage, et.al., Smart Grid Technology and Applications, Wiley Publications, 1st edition, 2012.
2. James Momoh, Smart Grid: Fundamentals of Design and Analysis, Wiley, IEEE Press, 1st edition, 2012.
3. Bharat Modi, Anuprakash, Yogesh Kumar, Fundamentals of Smart Grid Technology, S.K Kataria& Sons, 1st edition, 2019.

Reference Books:

1. Eric D. Knapp, Raj Samani, Applied Cyber Security and the Smart Grid-Implementing Security Controls into the Modern Power Infrastructure, Syngress Publishers, 1st edition, 2013.

2. Noure dine Had j said, Jean Claude Sabonnadiere, Smart Grids, Wiley Blackwell Publications, 1st edition, 2012.
3. Peter-Fox Penner, Smart Power: Climate Changes, the Smart Grid and the future of electric utilities, Island Press, 1st edition, 2010.

Online Learning Resources:

www.indiasmartgrid.org

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	POWER ELECTRONICS LAB	L	T	P	C
25G3D54105		0	0	4	2
	Semester	**I**			

Course Objectives: To make the student

- Understand the operation of Power Electronic converters.
- Gain a fair knowledge on the programming and simulation of Power Electronic converters.
- Apply the MATLAB/ Simulink for various controllers.
- Design a rectifier, inverter, chopper, cycloconverter and AC voltage controller .

Course Outcomes (CO): The student will be able to

- Understand the basic concept and its operation of Power Electronic converters. L2
- Analyse the output waveforms of the various converters designed. L4
- Apply mathematical relations to find THD and verify it practically. L3
- Design different controllers using Simulink. L5

List of Experiments:

1. Single Phase Fully Controlled Converter with R and R-L loads using MATLAB
2. Three Phase Fully Controlled Converter with R and R-L loads using MATLAB
3. Single Phase AC Voltage Controller with R and R-L loads using MATLAB.
4. Three Phase AC Voltage Controller with R and R-L loads using MATLAB.
5. Three Phase Inverter in 180° & 120° Conduction Mode with Star & Delta Connected loads using MATLAB.
6. Buck, Boost and Buck- Boost converter using MATLAB.
7. Closed loop control of Buck and Boost converter
8. Single Phase cycloconverter using MATLAB
9. Three Phase cycloconverter using MATLAB.
10. Single Phase Full Controlled Converter with R and R-L loads.
11. Designing of induction motor using Simulink
12. Performance measurement and analysis of 1-phase IGBT inverter with sinusoidal PWM control
13. Performance measurement and analysis of isolated DC-DC push-pull regulator
14. Hysteresis current control of a single-phase inverter

References:

1. PowerElectronicCircuits,DevicesandApplications-M.H.Rashid–PHI,2017
2. Ned Mohan, Power Electronics, JohnWiley,3rdedition,2011
3. https://pe2-iitd.vlabs.ac.in/List%20of%20experiments.html

Online Learning Resources:

1. **https://pe-iitr.vlabs.ac.in/Introduction.html**
2. **https://pe1-iitd.vlabs.ac.in/Introduction.html**
3. **https://pe2-iitd.vlabs.ac.in/**

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	**RENEWABLE ENERGY SOURCES LAB**	**L**	**T**	**P**	**C**
25G3D49105		**0**	**0**	**4**	**2**
	Semester	**I**			

Course Objectives: To make the student

- Understand the characteristics and behavior of renewable energy sources such as solar PV panels, wind generators, and batteries under different operating conditions.
- Develop practical skills in configuring, testing, and analyzing renewable energy systems, including PV arrays, MPPT controllers, inverters, and battery management.
- Gain experience in modeling and simulating renewable energy components, studying the effects of environmental factors like irradiation, temperature, and wind speed on system performance.
- Apply control and power electronics techniques (such as MPPT algorithms and DC-DC converters) for enhancing the efficiency, stability, and integration of renewable energy systems into the grid.

Course Outcomes (CO): Student will be able to

- To observe the I-V and P-V curves and Series and Parallel connection of Solar systems. L3
- To study the sun tracking and MPPT Charge Controllers of Solar systems. L2
- To analyse Power, Voltage & Frequency Measurement of Wind Generator. L4
- To Understand the Effect of temperature variation and Irradiation on Photovoltaic Array. L2

List of Experiments:

1. Draw the I-V and P-V curves of Solar Panel using PV Panel
2. Study of Series and Parallel connection of Solar Panels
3. Study of Sun tracking system
4. Maximum Power Point Tracking Charge Controllers
5. Inverter control for Solar PV based systems
6. Power, Voltage & Frequency Measurement of output of Wind Generator
7. Impact of load and wind speed on power output and its quality
8. Performance of frequency drop characteristics of induction generator at different loading condition
9. Charging and Discharging characteristics of Battery

Simulation Experiments

1. Modelling of PV Cell
2. Effect of temperature variation on Photovoltaic Array
3. Effect of Irradiation on a Photovoltaic Array
4. Design of solar PV boost converter using P&O MPPT technique

Web Sources: https://www.vlab.co.in

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	RESEARCH METHODOLOGY AND IPR	L	T	P	C
25G3DRM101		2	0	0	2
	Semester	**I**			

Course Objectives:

- Identify an appropriate research problem in their interesting domain.
- Understand ethical issues understand the Preparation of a research project thesis report.
- Understand the Preparation of a research project thesis report
- Understand the law of patent and copyrights.
- Understand the Adequate knowledge on IPR

Course Outcomes (CO): Student will be able to

- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I	**Research Problem: Meaning, Sources, Characteristics, and Approaches**	Lecture Hrs: 10

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, scope, and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II	**Literature Review, Research Ethics, Plagiarism & Technical Writing**	Lecture Hrs: 10

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT - III	**Intellectual Property Rights**	Lecture Hrs: 09

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT - IV	**Patent Rights, Licensing, Technology Transfer & GI**	Lecture Hrs: 09

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT - V	**Design Thinking for Business Innovation and Startups**	Lecture Hrs: 10

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Textbooks:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

Reference Books:

1. 1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for
2. beginners"
3. 2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
4. 3. Mayall, "Industrial Design", McGraw Hill, 1992.
5. 4. Niebel, "Product Design", McGraw Hill, 1974.

6. 5. Asimov, “Introduction to Design”, Prentice Hall, 1962.
7. 6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New
8. Technological Age”, 2016.

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	AI TECHNIQUES IN ELECTRICAL ENGINEERING (SE)	L	T	P	C
25G3D54103a		2	0	0	2
	Semester	**I**			

Course Objectives: To make the student

- To locate soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms.
- To observe the concepts of feed forward neural networks and about feedback neural networks.
- To practice the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy control
- To analyze genetic algorithm, genetic operations and genetic mutations

Course Outcomes (CO): Student will be able to

- Understand feed forward neural networks, feedback neural networks and learning techniques.
- Apply selected basic AI techniques; judge applicability of more advanced techniques.
- Analyze & Develop fuzzy logic control for applications in electrical engineering
- Develop genetic algorithm for applications in electrical engineering.

UNIT - I	ARTIFICIAL NEURAL NETWORKS	Lec Hrs: 10

Introduction-Models of Neural Network - Architectures – Knowledge representation – Artificial Intelligence and Neural networks – Learning process – Error correction learning – Hebbian learning – Competitive learning – Boltzmann learning – Supervised learning –Unsupervised learning – Reinforcement learning -learning tasks.

UNIT - II	ANN PARADIGMS	Lec Hrs: 9

Multi – layer perceptron using Back propagation Algorithm-Self – organizing Map –Radial Basis Function Network–Functional link network– Hopfield Network.

UNIT - III	FUZZYLOGIC	Lec Hrs: 9

Introduction – Fuzzy versus crisp – Fuzzy sets - Membership function – Basic Fuzzy set operations –Properties of Fuzzy sets – Fuzzy Cartesian Product – Operations on Fuzzy relations – Fuzzy logic – Fuzzy Quantifiers-Fuzzy Inference- Fuzzy Rule based system– Defuzzification methods.

UNIT - IV	GENETIC ALGORITHMS	Lec Hrs: 10

Introduction-Encoding– Fitness Function-Reproduction operators–Genetic Modeling –Genetic operators- Crossover-Single–site crossover –Two-point crossover–Multi point crossover-Uniform crossover–Matrix crossover-Crossover Rate-Inversion & Deletion–Mutation operator–Mutation–Mutation Rate-Bit-wise operators-Generational cycle-convergence of Genetic Algorithm.

UNIT - V	APPLICATIONS OF AI TECHNIQUES	Lec Hrs: 10

Load forecasting – Load flow studies – Economic load dispatch –Load frequency control – Single area system and two area system – Small Signal Stability (Dynamic stability)- Reactive power control – speed control of DC and AC Motors.

Textbooks:

1.S. Rajasekaran and G.A.V. Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms" PHI, New Delhi, 2nd edition,2017.

2.Sudarshan K. Valluru and T. Nageswara Rao, "introduction to Neural Networks, Fuzzy Logic & Genetic Algorithms", Jaico Publishing House, 1st edition, 2010.

Reference Books:

1. P.D. Wasserman, VanNostrand Reinhold," NeuralComputingTheory&Practice",NewYork,1st . Eddition ,1989
2. Bart Kosko, "Neural Network & Fuzzy System", Prentice Hall,1992.
3. G.J. Klir and T.A. Folger, "Fuzzy sets, Uncertainty and Information", Pearson, 1st edition, 2015.
4. D.E. Goldberg, "Genetic Algorithms", Pearson Education India, 1st edition, 2008.

Online Learning Resources:

1. **https://onlinecourses.swayam2.ac.in/ntr24_ed08/preview**
2. **https://onlinecourses.nptel.ac.in/noc23_ge36/preview**
3. **https://onlinecourses.nptel.ac.in/noc22_hs59/preview**

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	ENGLISH FOR RESEARCH PAPER WRITING (AC-I)	L	T	P	C
25G3DAC101a		2	0	0	0
	Semester	I			

Course Objectives: This course will enable students:

- Understand the essentials of writing skills and their level of readability
- Learn about what to write in each section
- Ensure qualitative presentation with linguistic accuracy

Course Outcomes (CO): Student will be able to

- Understand the significance of writing skills and the level of readability
- Analyze and write title, abstract, different sections in research paper
- Develop the skills needed while writing a research paper

UNIT - I	**Overview of a Research Paper**	Lecture Hrs:10

Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity

UNIT - II	**Essential Components of a Research Paper**	Lecture Hrs:10

Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization

UNIT - III	**Review of the Literature**	Lecture Hrs:10

Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion-Conclusions-Recommendations.

UNIT - IV	**Key skills needed for writing**	Lecture Hrs:9

Key skills needed for writing a Title, Abstract, and Introduction

UNIT - V	**Appropriate language to formulate**	Lecture Hrs:9

Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions

Suggested Reading

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I]
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	DISASTER MANAGEMENT (AC-I)	L	T	P	C
25G3DAC101b		2	0	0	0
	Semester	**I**			

Course Objectives: This course will enable students:

- Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.
- Developanunderstandingofstandardsofhumanitarianresponseandpracticalrelevanceinspecific types of disasters and conflict situations
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

UNIT - I	**Introduction to Disaster**	Lecture Hrs:10

Introduction: Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics

UNIT - II	**Repercussions of Disasters and Hazards**	Lecture Hrs:10

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT - III	**Disaster Preparedness and Management**	Lecture Hrs:09

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering A dis aster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT - IV	**Risk Assessment and Disaster Risk**	Lecture Hrs:10

Risk Assessment Disaster Risk:

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT - V	**Disaster Mitigation**	Lecture Hrs:09

Disaster Mitigation:

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Suggested Reading
1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies 2. "'New Royal book Company.. Sahni, Pardeep Et.Al.(Eds.), "Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi. 3. Goel S.L., Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	SANSKRIT FOR TECHNICAL KNOWLEDGE (AC-I)	L	T	P	C
25G3DAC101c		2	0	0	0
	Semester	**I**			

Course Objectives: This course will enable students:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge
- Knowledge from ancient literature

Course Outcomes (CO): Student will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science &technology can be understood
- Being a logical language will help to develop logic in students

UNIT - I	**Alphabets in Sanskrit**	Lecture Hrs:10
Alphabets in Sanskrit		
UNIT - II	**Past/Present/Future Tense and Simple Sentences**	Lecture Hrs:10
Past/Present/Future Tense, Simple Sentences		
UNIT - III	**Order and Introduction of Roots**	Lecture Hrs:09
Order, Introduction of roots		
UNIT - IV	**Technical information about Sanskrit Literature**	Lecture Hrs:09
Technical information about Sanskrit Literature		
UNIT - V	**Technical concepts of Engineering**	Lecture Hrs:10
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics		

Suggested Reading

1. "Abhyas pustakam" –Dr. Vishwas, Sanskrit-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha- Vempati Kutumb shastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	Advanced Power Electronics	L	T	P	C
25G3D54201		3	0	0	3
	Semester	**II**			

Course Objectives: To make the student

- Remember and Understand the construction, operation and characteristics of various power semiconductor devices and to analyze the cause of voltage unbalance and necessary actions for equalization of GCTs and IGBTs.
- Analyze the construction and working principle of various types of resonant pulse inverters, resonant converters and multi inverters.
- Analyze the various pulse modulations and advanced modulations techniques available.
- Apply the above concepts to choose appropriate device for a particular converter topology.

Course Outcomes (CO): Student will be able to

- Understand the characteristics of various power semiconductor devices.
- Analyze the operation of various types of resonant pulse inverters, resonant converters and multi inverters.
- Analyze various pulse modulation and advanced modulation techniques available.
- Apply the above concepts to choose appropriate device for particular topology.

UNIT - I	HIGH-POWER SEMICONDUCTOR DEVICES	Lec Hrs: 9

Introduction – High Power Switching Devices – Diodes – Silicon-Controlled Rectifier (SCR) – Gate Turn Off (GTO) Thyristor –Gate Commutated Thyristor (GCT) –Insulated Gate Bipolar Transistor (IGBT) –Other Switching Devices –Operation of Series Connected Devices –Main Causes of Voltage Unbalance –Voltage Equalization for GCTs– Voltage Equalization for IGBTs.

UNIT - II	RESONANT PULSE INVERTERS	Lec Hrs: 10

Resonant pulse inverters–Series resonant inverters- Series resonant inverters with unidirectional and bidirectional switches-Analysis of half bridge resonant inverter- Evaluation of currents and Voltages of a simple-resonant inverter– Analysis of half bridge and full bridge resonant inverter with bidirectional switches– Frequency response of series resonant inverter for series loaded inverter and parallel resonant inverters–Voltage control of resonant inverters- Class-E resonant inverter– Class-E resonant rectifier- Evaluation of values of C and L for class E inverter and Class E rectifier – Numerical problems.

UNIT - III	RESONANT CONVERTERS	Lec Hrs: 10

Resonant converters- Zero current switching resonant converters – L type - M type– Zero voltage Switching resonant converters – comparison between ZCS and ZVS resonant converters- Two quadrant ZVS resonant converters – Resonant dc link inverters- Evaluation of L and C for zero current switching inverter – Numerical problems.

UNIT - IV	MULTI LEVEL INVERTERS I	Lec Hrs: 10

Sinusoidal PWM –Modulation Scheme –Harmonic Content –Over modulation– Third Harmonic Injection PWM–Space Vector Modulation–Switching States–Space Vectors–Dwell Time Calculation– Modulation Index – Switching Sequence– Spectrum Analysis –Even-Order Harmonic Elimination – Discontinuous Space Vector Modulation– H-Bridge Inverter– Bipolar Pulse Width Modulation – Uni polar Pulse Width Modulation.

UNIT - V	MULTI LEVEL INVERTERS II	Lec Hrs: 10

Multilevel Inverter Topologies–CHB Inverter with Equal DC Voltage–H-Bridges with Unequal DC Voltages - Carrier Based PWM Schemes – Phase-Shifted Multicarrier Modulation–Level-Shifted Multicarrier Modulation– Comparison Between Phase and Level Shifted PWM Schemes –Staircase Modulation –Diode Clamped Multilevel Inverters – Three Level Inverter – Converter Configuration – Switching State – Commutation–Space Vector Modulation–Stationary Space Vectors – Dwell Time Calculation–Relationship Between V_{ref} Location and Dwell Times – Switching Sequence Design – Inverter Output Wave forms and Harmonic Content– Even-Order Harmonic Elimination.

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Textbooks:

1. Mohammed H. Rashid, "Power Electronics", Pearson Education, 4th edition, 2017.
2. Ned Mohan, Tore M. Undel and and William P. Robbind, "Power Electronics", John wiley &Sons, 3rd edition, 2007.

Reference Books:

1. Daniel W. Hart, "Power Electronics", McGraw Hill Publications,1st edition, 2010.
2. V.R. Moorthi, "Power Electronics Devices, Circuits and Industrial applications", Oxford University Press, 2005.
3. Dr. P.S. Bimbhra, "Power Electronics", Khanna Pubishers,2006.
3. Philip T. Krein, "Elements of Power Electronics", Oxford UniversityPress,2nd edition, 2014.
4. BinWu, "High-Power Converters and AC Drives", IEEE Press Ajohn Wiley &Sons, 2nd edition, 2017.

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	FACTS CONTROLLERS	L	T	P	C
25G3D49202		3	0	0	3
	Semester	II			

Course Objectives: To make the student

- To understand the fundamentals of FACTS Controllers, Importance of controllable parameters and types of FACTS controllers & their benefits
- To explain control of STATCOM and SVC and their comparison and the regulation of STATCOM
- To remember the objectives of Shunt and Series compensation
- To analyze the functioning and control of GCSC, TSSC and TCSC

Course Outcomes (CO): Student will be able to

- Understand various control techniques for the purpose of identifying the scope and for selection of specific FACTS controllers.
- Remember different types of controllable VAR generation and variable impedance techniques.
- Design simple converters using FACTS controllers.
- Understand the operation of Unified Power Controller and Hybrid Arrangements.

UNIT - I	FACTS CONCEPTS, VSI AND CSI	Lecture Hrs: 10

Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers. Single phase three phase full wave bridge converters transformer connections for 12 pulse 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters.

UNIT - II	SHUNT COMPENSATION	Lecture Hrs: 8

Objectives of shunt compensation - Methods of controllable var generation - Variable impedance type static var generators - switching converter type var generators - hybrid var generators – Comparison of SVC and STATCOM.

UNIT - III	SERIES COMPENSATION	Lecture Hrs: 12

Objectives of series compensation – GTO Thyristor Controlled Series Capacitor (GCSC) - Thyristor Switched Series Capacitor (TSSC) - Thyristor Controlled Series Capacitor (TCSC) - Control schemes for TCSC, TSSC and TCSC.

UNIT - IV	UNIFIED POWER FLOW CONTROLLER (UPFC)	Lecture Hrs:12

Introduction - 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 - Hybrid Arrangements: UPFC With a Phase Shifting Transformer.

UNIT - V	INTERLINE POWER FLOW CONTROLLER (IPFC)	Lecture Hrs:10

Introduction, basic operating principle and characteristics of IPFC, control structure, practical and application considerations, generalized and multifunctional fact controllers

Textbooks:

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, 1st edition, 2004

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	AC DRIVES	L	T	P	C
25G3D54202a	(PE-III)	3	0	0	3
	Semester	**II**			

Course Objectives: To make the student

- Remember and Understand the working principle and control of various AC and Special purpose motor Drives.
- Analyze the control strategies for VSI fed sensor-less induction motor drives, CSI fed induction motor drives, and VSI fed poly– phase induction motors.
- Analyze and apply control schemes for PMSM, BLDC and Switched Reluctance Motor drives.
- Design high performance induction motor drives using the principles of Scalar control and develop vector control, direct torque control and introduction of f ive phase induction motor drive.

Course Outcomes (CO): Student will be able to

- Understand the working principle and operation of AC and Special purpose motor Drives.
- Formulate the control strategies for VSI fed sensor-less induction motor drives, CSI fed induction motor drives, and VSI fed poly– phase induction motors.
- Implement control schemes for PMSM, BLDC and Switched Reluctance Motor drives.
- Analyze high performance induction motor drives using the principles of Scalar control and develop vector control, direct torque control and introduction of five phase induction motor drive.

UNIT - I	**Induction Motor drives**	**Lec Hrs: 10**

Control of Induction Motor Drive - Scalar control of induction motor-Principle of vector control and field orientation Sensor less control and flux observers - Direct torque and flux control of induction motor Multilevel converter-fed induction motor drive - Utility friendly induction motor drive Implementation of V/f control with slip compensation scheme, Review of dq0 model of 3 –phase IM with simulation studies.

UNIT - II	**Control techniques of IM drives**	**Lec Hrs: 10**

Direct vector control -Indirect vector control with feedback-Indirect vector control with feed–forward- Indirect vector control in various frames of reference -Decoupling of vector control with feed forward compensation - sensor less control of IM, Direct Torque Control of IM - Speed control of wound induction motor with rotor side control - introduction to five phase induction motor drives.

UNIT - III	**Synchronous Motor Drives**	**Lec Hrs: 9**

Control of Synchronous Motor - Self controlled synchronous motor – Vector control of synchronous motor – Cycloconverter fed synchronous motor drive -Control of synchronous reluctance motor.

UNIT - IV	**Permanent Magnet Drives**	**Lec Hrs: 9**

PM Synchronous motors: Types – Construction - operating principle-Expression for torque - Model of PMSM - Implementation of vector control for PMSM - BLDC drives- PMDC motor drives.

UNIT - V	**SRM DRIVE & ITS CONTROLLER**	**Lec Hrs: 10**

Construction - Operating Principle -Torque expression-SRM configuration and its controller design – converter topologies – control strategies – Sensor less control. Principles of fuzzy logic control and neural network– Design methodology and block diagram implementation of DC drive and vector controlled induction motor.

Recent trends in fuzzy control of electrical drives. MATLAB simulation – Fuzzy logic speed control of three phase induction motor drive –Adaptive speed control for induction motor drives using neural network.

Textbooks:

1. Modern Power Electronics & AC Drives – B.K. Bose, Pearson, Second edition,2005.
2. R. Krishnan, “Electric Motor Drives: Modelling, Analysis and Control”, Pearson, 1st edition,2015.

Reference Books:

1. Bin-Wu, “High– Power Converters and AC Drives”, IEEE Press, John Wiley &Sons, 2nd edition, 2017

2. M.B. Patil, V. Ramanarayanan, V.T. Ranganathan, "SimulationofPowerElectronicCircuits",NarosaPublications,2009, Reprint 2013.
3. Relevant Papers from journals.
4. P.C. Krause, O. Wasynczuk, S. D. Sudhoff and Steven D. Pekarek, "Analysis of Electric Machinery", Wiley, IEEE Press, 3rd edition, 2013.
5. P. S. Bhimbra, "Generalized Theory of Electric Machines", Khanna Publication, 7th edition, 2021.
6. Ion Boldea , Syed A. Nasar "Electric Drives 3rd Edition, Kindle Edition" 3rd Edition,2016.

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	ADVANCED POWER SEMICONDUCTOR DEVICES & PROTECTION (PE-III)	L	T	P	C
25G3D54202b		3	0	0	3
	Semester	II			

Course Objectives: To make the student

- Remember and Understand the construction, operation, characteristics and safe operating regions of various power semiconductor devices such as BJT, MOSFET, GTO and IGBT.
- Apply the basics of above to understand the various types of emerging power semi conductor devices such as power JFET and MOS controlled thyristor.
- Analyze the concept of Electro Magnetic Interference, Noise, their sources and effect of them on electronic equipment.
- Design protection devices and circuits like heat sinks, voltage and current protection circuits.

Course Outcomes (CO): Student will be able

- To understand the characteristics of various power semiconductor devices such as BJT, MOSFET, GTO and IGBT
- Apply the above to understand the various types of emerging power semi conductor devices
- To analyze the concept of Electro Magnetic Interference, Noise, their sources and effect of them on electronic equipment.
- To design protection devices and circuits like heat sinks, voltage and current protection circuits.

UNIT - I	BJTS &Power MOSFET	Lec Hrs: 10

Introduction- Vertical power transistor structures- I-V characteristics- Operation – Switching characteristics- Break down voltages-Second break down- ON state losses- Safe Operation Areas- Design of drive circuits for BJTs- Snubber circuits for BJTs and Darling tons.
Power MOSFETs -Introduction-Basic structures- I-V characteristics - Physics of device operation- Switching Characteristics-Operation limitations – Safe Operating Areas- Design of gate drive circuits-Snubber circuits.

UNIT - II	GTO & IGBT	Lec Hrs: 10

Introduction- Basic structures- I-V characteristics- Physics of device operation-GTO switching Characteristics- Snubber circuits- Over protection of GTOs.
Insulated Gate Bipolar Transistors - Introduction- Basic structures- I-V characteristics -Physics of device operation- Latch in IGBT switching Characteristics-Device limits and Safe Operating Areas- Snubber circuits.

UNIT - III	EMERGING DEVICES AND CIRCUITS	Lec Hrs: 9

Introduction-Power junction field effect transistors- Field Controlled Thyristor- JFET based devices Versus other power devices- MOS controlled Thyristors- High voltage integrated circuits- New Semiconductor materials- Introduction to Gallium Nitride and Silicon Carbide Devices.

UNIT - IV	PASSIVE COMPONENTS AND ELECTRO MAGNETIC COMPATIBILITY	Lec Hrs: 9

Introduction- Design of inductor- Transformer design- Selection of capacitors and resistors- Current Measurements - Heatsinking circuit layout–Electromagnetic Interference (EMI)- Sources of EMI Electromagnetic Interference in Power Electronic Equipment

UNIT - V	NOISE & PROTECTION DEVICES	Lec Hrs: 10

Noise sources in SMPS- Diode Storage Charge Noise- Noise generated due to switching-Common noises sources in SMPS- Noises Due to High frequency transformer- Measurement of Noise- Minimizing EMI-EMI shielding- EMI standards.
Protection of Devices& Circuits - Cooling & Heat sinks – Thermal modeling of power switching devices- Snubber circuits – Reverse recovery transients – Supply and load side transients –Voltage protections– Current protections.

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Textbooks:
1. M.H. Rashid, "Power Electronics Circuits, Devices and Applications" Pearson Education, 4th edition, 2017. 2. Mohanand Undel and, "Power Electronics Converters, Applications and Design", JohnWiley &Sons,3rd edition, 2007. 3. B.W. Williams, "Power Electronics Circuit Devices, Drivers and Applications and passive components", MC Graw hill higher education, 2nd edition, 1992.
Reference Books:
1. Vithayathil, "Power Electronics Circuits", MC Graw Hill Education, Indian edition, 2017. 2. W.C. Lander, "Power Electronics Circuits", Tata MC Graw Hill,3rdEdition, 1995. 3. Loganathan Umanand, "Power Electronics: Essentials and Applications", Wiley India Pvt. Ltd,2009.
Online Learning Resources:
1. http://nptelonlinecourses.iitm.ac.in/courses/108104011/

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	APPLICATIONS OF POWER CONVERTERS (PE-III)	L	T	P	C
25G3D54202c		3	0	0	3
	Semester	II			

Course Objectives: To make the student

- Understand the power electronic application requirements.
- Remember the various power converters used in different applications for high and low voltage power supplies.
- Analyze the various power supplies used in modern microprocessor and computer loads.
- Apply the above concepts to design a bi-directional DC-DC converters for charge/discharge applications.

Course Outcomes (CO): Student will be able

- To understand the power electronic application requirements.
- To identify the suitable power converter from the available configurations.
- To develop the improved power converters for any stringent application requirements.
- To design a bi-directional DC-DC converters for charge/discharge applications.

UNIT - I	Inverters for Induction Heating	Lec Hrs: 9

For induction cooking – high frequency inverters for induction heating - Induction hardening – Melting – Electric welding control – Welding applications.

UNIT - II	Power Converters for Lighting, pumping and refrigeration Systems	Lec Hrs: 10

Electronic ballast - LED power drivers for indoor and outdoor applications - PFC based grid fed LED drivers - PV / battery fed LED drivers –Pv fed power supplies for pumping/refrigeration -Applications.

UNIT - III	High Voltage Power Supplies	Lec Hrs: 10

Power supplies for X-ray applications - Power supplies for radar applications-Power supplies for space applications.

UNIT - IV	Low voltage high current power supplies	Lec Hrs: 9

Power converters for modern microprocessor and computer load

UNIT - V	Bi-directional DC-DC(BDC)converters	Lec Hrs: 10

Electric traction - Automotive Electronics and charge/discharge applications -Line Conditioners and Solar Charge Controllers.

Textbooks:

1. Ali Emadi, A. Nasiri and S. B. Bekiarov, "Uninterruptible Power Supplies and Active Filters", CRC Press, 1st edition, 2005.
2. M. Ehsani, Y. Gao, E. G. Sebastien and A. Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles", Standards media, 2ndEdition,2009.

Reference Books:

1. William Ribbens, "Understanding Automotive Electronics", BH, 8th edition, 2003.
2. N. Mohan, T.M. Undeland and W.P. Robbins, "Power Electronics Converters, Applications and design", John Wiley and Sons, 3rd edition, 2007
3. M. H. Rashid, "Power Electronics Circuits, Devices and Applications", Pearson publications, 3rd Edition, 2004

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	**POWER QUALITY**	**L**	**T**	**P**	**C**
25G3D49204a	**(PE- IV)**	**3**	**0**	**0**	**3**
	Semester	**II**			

Course Objectives: To make the student

- To understand power quality definition, power quality standards.
- To remember measuring & solving power quality problems.
- To apply the various types of linear and nonlinear loads
- To analyse harmonic methodology, mitigation techniques and case study

Course Outcomes (CO): Student will be able to

- Understand the fundamentals & terminology of power quality.
- Apply the concept of power frequency disturbances, types of transients & transient waveforms.
- Analyze the harmonic methodology & Electromagnetic Interference concepts.
- Remember the necessity of grounding and methods of grounding.
- Understand different techniques of measuring & solving power quality problems

UNIT - I	**INTRODUCTION TO POWERQUALITY**	Lecture Hrs: 10

Definition of Power Quality - Power Quality Progression - Power Quality Terminology - Power Quality Issues– Responsibilities of Power Suppliers and Users-Power Quality Standards.

UNIT - II	**POWER FREQUENCY DISTURBANCE & TRANSIENTS**	Lecture Hrs: 8

Introduction to Power Frequency Disturbance - Common Power Frequency Disturbances – Characteristics of Low Frequency Disturbances - Voltage Tolerance Criteria- ITIC Graph - Introduction to Transients -Transient System Model - Examples of Transient Models and Their Response - Power System Transient Modeling-Types and Causes of Transients -Examples of Transient Waveforms.

UNIT - III	**HARMONICS & ELECTROMAGNETIC INTERFERENCE (EMI)**	Lecture Hrs: 12

Definition of Harmonics - Harmonic Number (h) - Odd and Even Order Harmonics - Harmonic Phase Rotation and Phase Angle - Voltage and Current Harmonics - Individual and Total Harmonic Distortion -Harmonic Signatures - Effect of Harmonics On Power System Devices - Guidelines For Harmonic Voltage and Current Limitation - Harmonic Current Mitigation - Introduction to EMI - Frequency Classification –Electrical Fields-Magnetic Fields-EMI Terminology-Power Frequency Fields-High Frequency Interference-EMI Susceptibility-EMI Mitigation-Cable Shielding-Health Concerns of EMI.

UNIT - IV	**GROUNDING AND BONDING**	Lecture Hrs:12

Introduction to Grounding and Bonding-Shock and Fire Hazards-NEC Grounding Requirements-Essentials of a Grounded System-Ground Electrodes-Earth Resistance Tests-Earth Ground Grid Systems-Power Ground System-Signal Reference Ground (SRG)-SRG Methods-Single and Multipoint Grounding –Ground Loops – Electro chemical Reaction -Examples of Grounding Anomalies.

UNIT - V	**MEASURING AND SOLVING POWER QUALITY PROBLEMS**	Lecture Hrs:10

Introduction to Power Quality Measurements-Power Quality Measurement Devices-Power Quality Measurements Test Locations-Test Duration-Instrument Setup- Instrument Guidelines – Power quality mitigating concepts and devices.

Textbooks:

1. Power quality by C. Sankaran, CRC Press, 1st Edition, 2001
2. Electrical Power Systems Quality, Roger C. Dugan, Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty, 2nd Edition, TMH Education Pvt. Ltd, 1996.

Reference Books:

1. Understanding Power quality problems by Math H. J.Bollen IEEE Press, 1st edition, 2000.
2. Power quality enhancement using custom power devices by Arindam, Ghosh, Gerard Ledwich, Kluwer, Academic publishers, 1st edition, 2002.

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	EV CHARGING INFRASTRUCTURE & TECHNOLOGY	L	T	P	C
25G3D49205a	(PE- IV)	3	0	0	3
	Semester	II			

Course Objectives: To make the student

- To understand the fundamentals of Electric Vehicles (EVs) and battery charging requirements.
- To remember various EV charging methods, standards, and interoperability issues.
- To apply concepts of charger design, communication protocols, and charging station architecture.
- To analyse grid integration issues, charging impact on power systems, and mitigation techniques.
- To understand policies, safety guidelines, and future trends in EV charging technologies.

Course Outcomes (CO): Student will be able to

- Understand EV charging fundamentals and technical terminology.
- Apply charging methods, levels, and global standards used in EV technology.
- Analyze EV charger components, power electronics, and communication protocols.
- Remember grid integration issues, load management, and safety requirements.
- Understand planning, measuring, and solving issues in EV charging infrastructure.

UNIT - I	INTRODUCTION TO ELECTRIC VEHICLES & CHARGING FUNDAMENTALS	Lecture Hrs: 10

Definition of Electric Vehicles – Types of Electric Vehicles (BEV, HEV, PHEV, FCEV) – EV Market Progression – Battery Technologies for EVs (Li-ion, LFP, NMC, Solid-State – overview) – Battery Charging Basics: Voltage Levels, C-rate, SoC, DoD – Charging Levels (L1, L2, L3) – Charging Modes (Mode 1 to Mode 4 as per IEC 61851) – EV Charging Terminology – Global and Indian EV Charging Scenario.

UNIT - II	EV CHARGING TECHNOLOGIES, STANDARDS & CONNECTORS	Lecture Hrs: 8

Types of EV Chargers – AC Charging (Slow/Medium) – DC Charging (Fast, Ultrafast) – Wireless Charging: Inductive and Resonant – On-board and Off-board Charging – International Standards: IEC 61851, IEC 62196, SAE J1772, CCS, CHAdeMO, GB/T – Indian Standards: Bharat AC001, DC001 – Connector Types and Their Classification – Vehicle Communication and Interoperability – Introduction to V2G and V2H Concepts.

UNIT - III	EVSE ARCHITECTURE, COMPONENTS & COMMUNICATION PROTOCOLS	Lecture Hrs: 12

EVSE (Electric Vehicle Supply Equipment) Architecture – Charger Components: AC/DC Converters, DC/DC Converters, Filtering, Contactors, Metering Systems – Power Electronic Interfaces in EV Chargers – Charging Station Layout – EV Energy Flow – Communication Protocols: OCPP, ISO 15118, PLC, CAN – Smart Charging Systems – Billing & Authentication (RFID, Mobile App, QR Code) – Charging Station Software and Cloud Management – Cybersecurity Challenges.

UNIT - IV	GRID INTEGRATION, LOAD MANAGEMENT & SAFETY	Lecture Hrs:12

EV Impact on Grid: Voltage Regulation, Phase Imbalance, Transformer Loading – Load Curve Shaping – Demand Side Management – Renewable Energy Integrated EV Charging (Solar + EV) – Energy Storage Systems for Charging Stations – Power Quality Issues due to EV Charging – Mitigation Techniques – Safety Standards for EVSE: Electrical Safety, Fault Protection, Earthing, Fire Safety – Site Safety Requirements – EMI/EMC Concerns in EV Charging – Case Studies of Grid Stress & Solutions.

UNIT - V	PLANNING, MEASURING & SOLVING EV CHARGING INFRASTRUCTURE ISSUES	Lecture Hrs:10

EV Charging Station Planning: Site Assessment, Load Estimation, Transformer Sizing – Economic Analysis of Charging Stations – Installation Guidelines – Testing & Commissioning – Measurement of Charging Parameters – Charging Station Testing Devices – Test Location & Duration – Instrumentation for Charger Evaluation – Policies & Regulations (India & Global) – Business Models: Public, Private, Fleet, Highway Corridors – EV Charging Mitigation Techniques & Advanced Technologies: Battery Swapping, Smart Grids, Microgrids.

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Textbooks:

1. Electric Vehicle Technology Explained – James Larminie, John Lowry, Wiley Publications.
2. Electric and Hybrid Vehicles: Design Fundamentals – Iqbal Husain, CRC Press.
3. Advanced Electric Drive Vehicles – Ali Emadi, CRC Press.

Reference Books:

1. Electric Vehicle Integration into Modern Power Networks – Fereidoon Sioshansi, Springer.
2. Energy Management Strategies for Electric and Plug-In Hybrid Electric Vehicles – Sheldon S. Williamson, Springer.
3. BIS & MoP Guidelines for EV Charging Standards (India).
4. SAE, IEC, CHAdeMO Association – EV Charging Standards Documentation.

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	DIGITAL SIGNAL PROCESSORS AND APPLICATIONS (PE-IV)	L	T	P	C
25G3D54203b		3	0	0	3
	Semester	**II**			

Course Objectives: To make the student

- Identify and describe the basic and advanced concepts of various DSP Processors.
- To use the basic and advanced concepts in order to develop various programmable based DSP applications.
- To explain the operation and performance of DSP based designs.
- To create DSP based controllers and processors for various simulation /real time based applications.

Course Outcomes (CO): Student will be able to

- Understand the basic and advanced concepts of different DSP Processors.
- Apply the basic and advanced concepts in order to develop various programmable based DSP applications.
- Analyze the operation and performance of DSP based designs for various real time issues.
- Design / create DSP based controllers and processors for various simulation /real time based applications.

UNIT - I	DSP CONTROLLER TMSLF2407	Lec Hrs: 10

Introduction to the TMSLF2407 DSP Controller- Brief Introduction to Peripherals - Types of Physical Memory-Software Tools.

C2XX DSP CPU and instruction set- Introduction to the C2xx DSP Core and Code Generation – The Components of the C2xx DSP Core - Mapping External Devices to the C2xx Core and the Peripheral Interface -System Configuration Registers –Memory -Memory Addressing Modes -Assembly Programming Using the C2xxDSP Instruction Set.

UNIT - II	DATA TRANSFER AND COMMUNICATION	Lec Hrs: 9

Parallel and Serial Data Transfer- Pin Multiplexing (MUX) and General Purpose I/O Overview-Multiplexing and General Purpose I/O Control Registers - Using the General Purpose I/O Ports, Serial Communication.

UNIT - III	DSP CONTROLLER TMS320LF24	Lec Hrs: 9

Interrupt system of TMS320LF2407- Introduction to Interrupts - Interrupt Hierarchy - Interrupt Control Registers- Initializing and Servicing Interrupts in Software- real time control with interrupts.

The analog-to-digital converter (ADC)-ADC Overview- Operation of the ADC and programming modes.

UNIT - IV	DSP CONTROLLER APPLICATIONS	Lec Hrs: 10

Event Managers (EVA, EVB)- Overview of the Event Manager (EV) - Event Manager Interrupts – General Purpose (GP) Timers- Compare Units - Capture Units and Quadrature Encoded Pulse (QEP) Circuitry – General Event Manager Information-PWM Signal Generation with Event Managers and interrupts, Measurement of speed with Capture Units, Implementation of Space Vector Modulation with DSPTMSLF2407A

UNIT - V	FIELD PROGRAMMABLE GATE ARRAY	Lec Hrs: 10

Field Programmable Gate Arrays- Introduction to Field Programmable Gate Arrays – CPLD Vs FPGA – Types of FPGA, Configurable logic Blocks (CLB), Input/output Block (IOB) –Programmable Interconnect Point (PIP)- HDL programming –overview of Spartan 6 & ISE Design Suite, Implementation of PWM technique with SPARTAN-6 FPGA

Textbooks:

1. Hamid A. Tolyat, “DSP based Electromechanical Motion Control”, CRCpress,1st edition, 2004.
2. Wayne Wolf, “FPGA based system design”, Prenticehall,1st edition, 2004.

Reference Books:

1. Application Notes from the website of Texas Instruments
2. Spartan-6FPGAConfigurableLogicBlock,2010 XilinxSpartan6Datasheets

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	ELECTRIC DRIVES LAB	L	T	P	C
25G3D54204		0	0	4	2
	Semester	II			

Course Objectives: To make the student

- Understand and analyze torque speed characteristics of DC motors, 3 phase Induction Motor and PMSM with various converters connected.
- Apply and analyze various modulation techniques on different drives.
- Analyze performance of Induction Motors when different converters are connected.
- Analyze various types of drives when v/f control method are applied.

Course Outcomes (CO): Student will be able to

- To get practical training and hand on for the hardware and software application used in electric drives.
- To understand the practical problems and limitations of the methods used in electric drives.
- Apply and analyze various modulation techniques on different motor drives.
- Analyze performance of Induction Motors when different converters are connected.

List of Experiments:

1. Torque-Speed characteristics of DC motor using DC chopper.
2. Symmetrical angle control of1-phaseACmotorconnectedtoACvoltagecontroller
3. Single-Phase dual converter connected separately excited DC motor drive
4. Speed control of3-phase induction motor using open-loop V/f control technique
5. Torque-Speed characteristics of a 3-phase induction motor using IM- IM comprehensive drive system
5. Study of a Neutral Point Clamped inverter fed three-phase induction motor drive
6. Pulse width modulation control of 1-phase AC motor connected to AC voltage controller
7. Torque-Speed characteristics of a 3-phase Permanent Magnet Synchronous Motor (PMSM) using PMSM- IM comprehensive drive system
8. Torque-speed characteristics of a Separately Excited DC motor Drive fed by a two-pulse centre- tapped thyristor rectifier.
9. Torque-speed characteristics of a 6-pulse fully controlled rectifier fed Separately Excited DC motor Drive
10. Study of a four-quadrant Separately excited DC motor drive fed by dual- converter with circulating current control.
11. Study Class-D commutated chopper fed Separately Excited DC motor Drive
12. Verification of spectral performance of a 3-Ph VSI with V/Hz control of 3-Ph IM drives
13. Torque speed characteristics of a 3-Phinduction motor fed by a3-PhVSI
14. ImplementationofcentrespacedspacevectormodulationwithDSPforV/Hzcontrolofinduction motor drives
15. ImplementationofdiscontinuousspacevectormodulationwithDSPforV/Hzcontrolofinduction motor drives.

Note: Any ten experiments out of the list provided.

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	FACTS DEVICES & SIMULATION LAB	L	T	P	C
25G3D49206		0	0	4	2
	Semester	II			

Course Objectives: To make the student

- Understand how to write the coding in MATLAB/Mipower
- Apply the SVC, STATCOM for voltage profile improvements & UPFC in power system networks.
- Analyze the data related to load flows incorporating SVC & STATCOM.
- Analyze operation of TCSC, STATCOM & SSSC for a transmission line fed by an ac supply.

Course Outcomes (CO): Student will be able to

- Understand Load balancing using compensators.
- Apply load balancing using Compenasators.
- Analyse load flow incorporating SVC & STATCOM.
- Develop a Simulation model for STATCOM & UPFC.

List of Experiments:

1. Voltage regulation using shunt and series compensation
2. Load balancing in power system network using compensators
3. Simulation of TCSC
4. Voltage profile improvement using SVC
5. Voltage profile improvement using STATCOM
6. Transient Stability enhancement using STATCOM.
7. Simulation of UPFC with mathematical models
8. Load flow incorporating SVC
9. Load flow incorporating STATCOM
10. Simulation of DVR
11. Transmission Line Characteristics (P vs δ, Q vs δ, P vs Distance, Q vs Distance and V vs Distance) with and without Compensation
12. Sizing- simulation and operation of TCR and FC-TCR for a transmission line fed by an ac supply and feeding
    (a) Resistive/inductive/capacitive load one at a time
    (b) A load which can have leading as well as lagging behaviour
13. Sizing- simulation and operation of TCSC for a transmission line fed by an ac supply and feeding
    (a) Resistive/inductive/capacitive load one at a time
    (b) A load which can have leading as well as lagging behaviour
14. Sizing- simulation and operation of STATCOM for a transmission line fed by an ac supply and feeding
    (a) Resistive/inductive/capacitive load one at a time
    (b) A load which can have leading as well as lagging behaviour
15. Sizing- simulation and operation of SSSC for a transmission line fed by an ac supply and feeding
    (a) Resistive/inductive/capacitive load one at a time
    (b) A load which can have leading as well as lagging behaviour.

Web Sources: https://www.vlab.co.in

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	**QUANTUM TECHNOLOGIES AND APPLICATIONS**	**L**	**T**	**P**	**C**
25G3DRM201		**3**	**0**	**0**	**3**
	Semester	**II**			

Course Objectives: To make the student

- Introduce fundamental quantum concepts like superposition and entanglement.
- Understand theoretical structure of qubits and quantum information.
- Explore conceptual challenges in building quantum computers.
- Explain principles of quantum communication and computing.
- Examine real-world applications and the future of quantum technologies.

Course Outcomes (CO): Student will be able to

- Explain core quantum principles in a non-mathematical manner.
- Compare classical and quantum information systems.
- Identify theoretical issues in building quantum computers.
- Discuss quantum communication and computing concepts.
- Recognize applications, industry trends, and career paths in quantum technology.

UNIT - I	**INTRODUCTION TO QUANTUM THEORY AND TECHNOLOGIES**	Lecture Hrs: 10

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India‘s Quantum Mission, EU, USA, China

UNIT - II	**THEORETICAL STRUCTURE OF QUANTUM INFORMATION SYSTEMS**	Lecture Hrs: 8

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role.

UNIT - III	**BUILDING A QUANTUM COMPUTER – THEORETICAL CHALLENGES AND REQUIREMENTS**	Lecture Hrs: 12

What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what‘s working and what remains elusive, The role of quantum software in managing theoretical complexities.

UNIT - IV	**QUANTUM COMMUNICATION AND COMPUTING – THEORETICAL PERSPECTIVE**	Lecture Hrs:12

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD), Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once), Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential.

UNIT - V	**APPLICATIONS, USE CASES, AND THE QUANTUM FUTURE**	Lecture Hrs:10

Real-world application domains: Healthcare (drug discovery), Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, Psi Quantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race.

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Textbooks:

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

Reference Books:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. 2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. 3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.
4. 4. Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.

St. Johns College of Engineering and Technology (AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	PEDAGOGY STUDIES (AC-II)	L	T	P	C
25G3DAC201a		2	0	0	0
	Semester	**II**			

Course Objectives: This course will enable students:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes (CO): Student will be able to

Students will be able to understand:

- What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT - I	INTRODUCTION AND METHODOLOGY	Lecture Hrs:10

Introduction and Methodology: Aims and rationale, Policy back ground, Conceptual frame work and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT - II	THEMATIC OVERVIEW OF PEDAGOGICAL PRACTICES	Lecture Hrs:10

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT - III	EVIDENCE ON EFFECTIVE PEDAGOGICAL PRACTICES	Lecture Hrs:10

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT - IV	PROFESSIONAL DEVELOPMENT AND CLASSROOM SUPPORT	Lecture Hrs:10

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes.

UNIT - V	RESEARCH GAPS AND FUTURE DIRECTIONS	Lecture Hrs:10

Research gaps and future directions: Research design**,** Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

Suggested Reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.

2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of
3. Curriculum Studies, 36 (3): 361-379.
4. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
5. Akyeampong K, Lussier K, PryorJ, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
6. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
   Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

Course Code	STRUCTURE MANAGEMENT BY YOGA	L	T	P	C
25G3DAC201b		2	0	0	0
	Semester	**II**			

Course Objectives: This course will enable students:

- To achieve overall health of body and mind
- To overcome stress

Course Outcomes (CO): Student will be able to

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT - I	**EIGHT PARTS OF YOGA**	Lecture Hrs:10
Definitions of Eight parts of yoga. (Ashtanga)		
UNIT - II	**YAMA AND NIYAMA**	Lecture Hrs:10
Yam and Niyam.		
UNIT - III	**DO'S AND DON'TS IN LIFE**	Lecture Hrs:10
Do`s and Don't sin life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan		
UNIT - IV	**ASANAS AND PRANAYAMA**	Lecture Hrs:10
Asan and Pranayam		
UNIT - V	**YOGIC POSES, BENEFITS, AND BREATHING TECHNIQUE**	Lecture Hrs:10
i) Various yog poses and their benefits for mind &body ii) Regularization of breathing techniques and its effects-Types of pranayam		

Suggested Reading

1. 'Yogic Asanas for Group Training -Part-I": Janardan Swami Yoga bhyasi Mandal, Nagpur
2. "Raja yoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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COURSE STRUCTURE & SYLLABUS

Course Code	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENTSKILLS	L	T	P	C
25G3DAC201c		2	0	0	0
	Semester	**II**			

Course Objectives: This course will enable students:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes (CO): Student will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neeti shatakam will help in developing versatile personality of students

UNIT - I	**HOLISTIC PERSONALITY DEVELOPMENT**	Lecture Hrs:10

Neeti satakam- Holistic development of personality Verses-19,20,21,22(wisdom)
Verses-29,31,32(pride &heroism)
Verses-26,28,63,65(virtue)

UNIT - II	**PERSONALITY DEVELOPMENT**	Lecture Hrs:10

Neeti satakam- Holistic development of personality Verses-52,53,59(dont's)
Verses-71,73,75,78(do's)

UNIT - III	**APPROACH TO DAY-TO-DAY WORK AND DUTIES**	Lecture Hrs:10

Approach to day to day work and duties.
Shrimad Bhagwad Geeta: Chapter2-Verses41,47,48,
Chapter3-Verses13,21,27,35, Chapter6-Verses5,13,17,23,35,
Chapter18-Verses45,46,48.

UNIT - IV	**STATEMENTS OF BASIC KNOWLEDGE & ROLE MODELS**	Lecture Hrs:10

Statements of basic knowledge.
Shrimad Bhagwad Geeta: Chapter2-Verses 56,62,68
Chapter12 -Verses13,14,15,16,17,18
Personality of Role model. Shrimad Bhagwad Geeta:

UNIT - V	**ENLIGHTENMENT THROUGH PRACTICAL WISDOM**	Lecture Hrs:10

Chapter2-Verses 17, Chapter3-
Verses36,37,42, Chapter4-Verses18,38,39
Chapter18– Verses37,38,63

Suggested Reading

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P. Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.