PSN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution Recognised by AICTE, New Delhi and Affiliated to Anna University, Chennai)Accredited with A+ Grade by NAAC. An ISO 9001:2015 Certified Institution

Melathediyoor, Tirunelveli – 627 15

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.E. – EEE

CURRICULUM

R 2022- Curriculum (V to VI Semester)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT VISION	DEPARTMENT MISSION
To emerge as pre-eminence program for quality Electrical and Electronics Engineering Graduates.	• To enable quality infrastructure for advanced knowledge and skills towards learning under congenial environment for global placement, higher studies, research and entrepreneurship. • To stimulate the process of critical thinking and problem solving with special focus on research capabilities. • To enhance professional ethics, values and standards to meet the demands of society

PROGRAM EDUCATIONAL OBJECTIVES

S. No	Objective	PEOs
PEO1	Fundamental Knowledge	Apply their knowledge and skills to provide solutions to electrical and electronics engineering problems in industry and governmental organizations or to enhance student learning in educational institutions.
PEO2	Career Development	Work as a team with a sense of ethics and professionalism and communicate effectively to manage cross-cultural and multidisciplinary teams.
PEO3	**Social Identity**	Update their knowledge continuously through lifelong learning that contributes to personal, organizational, and societal growth.

PROGRAM OUTCOMES

PO's No	KNOWLEDGE	STATEMENTS	APPLIANCE
1	Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	Theory/ Practical / Project work

2	Problem Analysis	Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	Theory / Practical / Projects
3	Design / Development of Solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	Theory / Practical / Projects
4	Conduct Investigations of Complex Problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	Theory / Practicals
5	Modern Tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	Theory / Practical / Project work
6	The Engineer and Society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	Theory / Industrial visit / In plant training
7	Environment and Sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	Theory / Industrial Visit/ In plant Training
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	Theory / Industrial visit / In plant training
9	Individual and Team Work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Projects
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	Projects/ Seminar/ Mini Project
11	Project Management and Finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	Projects

12	Life-long Learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	Projects / Higher Studies

PROGRAM SPECIFIC OUTCOMES

PSO1	To apply fundamental knowledge to identify, formulate and investigate various real-time problems of power systems and simulations.
PSO2	To apply recent techniques along with modern software tools for designing, simulating and analyzing electrical and renewable energy systems.

CURRICULAM

B.E. Electrical and Electronics Engineering

Regulation R2022

Sl.No	Course code	Course Name	Category		L	T	P	C
1	IC610001	Professional English I	ICC	Theory	2	0	0	2
2	IC610002	Matrices and Calculus	ICC	Theory	2	1	0	3
3	IC610003	Engineering Physics	ICC	Theory	3	0	0	3
4	IC610004	Engineering Chemistry	ICC	Theory	3	0	0	3
5	CS610005	Problem Solving and 'C' Programming	ICC	Theory	3	0	0	3
6	ME610006	Engineering Graphics with CAD	ICC	Theory with Practical Component	2	0	2	3
7	IP610101	Physics & Chemistry Laboratory	ICC	Practical	0	0	3	1.5
8	IP610102	Programming in 'C' Laboratory	ICC	Practical	0	0	3	1.5
9		NCC/NSS/NSO *	IMC	Institute Mandatory	1*	0	0	0
10	IC610007	Tamil marabu/Heritage of Tamil	ICC	Theory	1	0	0	1
		Total			17	1	8	21

Sem - 02

11	IC620008	Professional English II	ICC	Theory with Practical Component	2	0	2	3
12	IC620009	Transforms & Partial Differential Equations	ICC	Theory	2	1	0	3
13	IC620010	Engineering Materials (for Non Circuit Branches)	ICC	Theory	3	0	0	3
	IC620011	Semiconductor Physics(for Circuit Branches)			3	0	0	
14	ME620012	Engineering Mechanics(for Non Circuit Branches)	PCC	Theory	3	0	0	3
	CS620013	Fundamentals of Artificial Intelligence (for Circuit Branches)			3	0	0	
15	CS620014	Python Programming	ICC	Theory	3	0	0	3
16	EE620015	Basic Engineering	ICC	Theory	3	0	0	3

17	IP620103	Python Laboratory	ICC	Practical	0	0	3	1.5
18	IP620104	Engineering practice laboratory	ICC	Practical	0	0	3	1.5
19	IM610401	Environmental Studies	IMC	Institute Mandatory	2*	0	0	0
20	IC620016	Tamils and technology	ICC	Theory	1	0	0	1
		Total			19	1	8	22

Sem - 03

21	IC630017	Numerical Methods and Statistics	ICC	Theory	3	0	0	3
22	EE630203	Electric Circuits and Networks	PCC	Theory with Practical Component	2	0	2	3
23	EC630901	Analog Electronic Circuits	PCC	Theory	3	0	0	3
24	EE630201	Measurements and Instrumentation	PCC	Theory	3	0	0	3
25	EE630202	Electromagnetic Fields	PCC	Theory With project	3	0	0	3
26		Professional Elective - I	PEC	Theory	3	0	0	3
27	EC630902	Analog Electronic Circuits Laboratory	PCC	Practical	0	0	3	1.5
28	EE630301	Measurements and Instrumentation Laboratory	PCC	Practical	0	0	3	1.5
29	EE630501	Integrated Aptitude Skills - I (Lower)	EEC	skill based course	0	0	1	0.5#
30	IM630402	Universal Human Values	IMC	Institute Mandatory	2*	0	0	0
		Total			19	0	9	21

Sem - 04

31	IC640018	Boundary value problems and probability distributions	ICC	Theory	3	0	0	3
32	EE640204	Electrical Control Systems	PCC	Theory with Practical Component	2	0	2	3
33	EE640205	DC Machines and Transformers	PCC	Theory with project	3	0	0	3
34	EE640206	Linear Integrated and Digital logic Circuits	PCC	Theory	3	0	0	3
35		Professional Elective - II	PEC	Theory	3	0	0	3
36		Institute Elective - I	IEC	Theory	3	0	0	3

37	EE640302	DC Machines and Transformers Laboratory	PCC	Practical	0	0	3	1.5
38	EE640303	Linear and Digital Circuits Laboratory	PCC	Practical	0	0	3	1.5
39	EE640502	Integrated Aptitude Skills - II (Lower)	EEC	skill based course	0	0	1	0.5#
40		In plant Training (2 Weeks)	IMC	Institute Mandatory				0
		Total			17	0	9	21

Sem - 05

41	EE650207	Power System Analysis	PCC	Theory with Practical Component	2	0	2	3
42	EE650208	Power Electronics	PCC	Theory with project	3	0	0	3
43	EE650209	Induction and Synchronous Machines	PCC	Theory	3	0	0	3
44		Institute elective -2	IEC	Theory	3	0	0	3
45		Professional elective-3	PEC	Theory	3	0	0	3
46		Professional elective-4	PEC	Theory	3	0	0	3
47	EE650304	Power Electronics Laboratory	PCC	Practical	0	0	3	1.5
48	EE650305	Induction and Synchronous Machines Laboratory	PCC	Practical	0	0	3	1.5
49		Integrated Aptitude Skills - I (Higher)	EEC	skill based course	0	0	2	1#
50	EE650801	Energy Audit and Environment Management	PMC	Programme Mandatory	2*	0	0	0
		Total			20	0	8	21

Sem - 06

51	EE660210	Digital Signal Processing	PCC	Theory with Practical Component	2	0	2	3
52	EE660211	Solid State Drives	PCC	Theory with project	3	0	0	3
53	EC660903	Microprocessor and Interfacing	PCC	Theory	3	0	0	3
54		Institute elective -3	IEC	Theory	3	0	0	3
55		Professional elective-5	PEC	Theory	3	0	0	3
56		Professional elective-6	PEC	Theory	3	0	0	3
57	EC660904	Microprocessor and Interfacing Laboratory	PCC	Practical	0	0	3	1.5

58	EE670307	Electrical Estimation, Costing and Power Wiring Laboratory	PCC	Practical	0	0	3	1.5
59	EE660504	Electrical Computer Aided Design (ECAD)	EEC	skill based course	0	0	2	1#
60	IM660403	Professional Ethics	IMC	Institute Mandatory	2*	0	0	0
61		Internship	IMC	Institute Mandatory				0
		Total			19	0	10	21

Sem - 07

62	EE670214	Power System Operation and Control	PCC	Theory with Practical Component	2	0	2	3
63	EE670212	Protection and Switchgear	PCC	Theory	3	0	0	3
64	EE670213	Electric Vehicles	PCC	Theory with project	3	0	0	3
65		Institute elective -3	IEC	Theory	3	0	0	3
66		Professional elective-7	PEC	Theory	3	0	0	3
67		Professional elective-8	PEC	Theory	3	0	0	3
68	EE660306	Power System Simulation Laboratory	PCC	Practical	0	0	3	1.5
69	EE670308	Green Energy Laboratory	PCC	Practical	0	0	3	1.5
70	MG670019	Innovation Entrepreneurship and Startups	ICC	Theory	3	0	0	3
71		Advanced career development	EEC	skill based course	0	0	2	1#
		Total			20	0	10	24

Sem - 08

72		Project Work	EEC	Practical	0	0	20	10

The credits will not be included for CGPA calculation.

*Mandatory courses for which no credits are assigned.

Semester wise Total credits									
SEM	I	II	III	IV	V	VI	VII	VIII	Total
Credit	21	22	21	21	21	21	24	10	161

Abbreviation	Particulars
ICC	Institute core Course (includes Basic science, Engineering science, humanities & social science including management course)
PCC	Professional core Course Course
PE	Professional Elective Course
IE	Institute Elective (open electives)
EEC	Employability Enhancement course
IMC	Institute Mandatory Course
PMC	Programme Mandatory Course

PROGRAMME ELECTIVES

S. No	Vertical -1 - POWER ENGINEERING	Vertical - 2 - CONVERTERS AND DRIVES	Vertical - 3 - EMBEDDED SYSTEMS	Vertical - 4 - CONTROL AND INTRUMENTATION	Vertical - 5 - GREEN TRANSPORTATION	Vertical - 6 – ELECTRICAL AND COMPUTATIONAL SCIENCES	Vertical - 7 - DIVERSIFIED COURSES
1	Conventional and Alternate Energy Sources	Power Electronics for Renewable Energy Systems	ARM Processors and Controllers	Sensors and Actuators	Electric Vehicle Design	Object Oriented Programming Using Java	Hybrid Energy Technology
2	Generation and Utilization of Electrical Energy	Control of Power Electronics Circuits	Embedded Computing System Design	Industrial Instrumentation	Vehicle Dynamics and Control	Operating Systems and Architecture	Energy Efficient Buildings
3	Transmission and Distribution	Design of Switched Mode Power Supply	Real Time Operating Systems	Medical Electronics	Modeling, Simulation and Control of Electric Vehicles	Data Structures Using C++	Bluetooth Technology
4	Flexible AC Transmission Systems	Multilevel Power Converters	Design of Embedded Systems	Process Control	Design of Motor and Power Converters for Electric Vehicles	Data Analysis Using Python for Electrical Engineers	Deep Learning
5	High Voltage Engineering	Digital System Design (NPTEL)	Software for Embedded Systems	Logic and Distributed Control System	Design of Electric Vehicle Charging System	Data Management for Smart Grid	Edge Computing
6	Power System Transients	Advanced Power Electronics	Embedded Linux	Industrial Data Networks	Testing of Electric Vehicles	Communication and Data Security in Electrical Engineering	Fuzzy Systems and Applications
7	Power Quality	Design of Electrical Machines	Embedded Control Systems Design	Robotics and Automation	Grid Integration of Electric Vehicles	Communication Protocols, Security and Protection for	Municipal Solid Waste Management (NPTEL)

						Smart Grid	
8	Power System Planning	Analysis of Electrical Machines	Embedded Control for Electrical Drives	Virtual Instrumentation	Fundamentals of Electric and Hybrid Vehicles	PLC Programming	Augmented Reality
9	Smart Grid: Basics to Advanced Technologies (NPTEL)	Analysis of Power Converters	Embedded System for Automotive Applications	Computer Control of Processes	Energy Storage and Management for Electric Vehicles	Machine Learning	MEMS Technology
10	Restructured Power Systems	Modern Rectifiers and Resonant Converters	Embedded Product Development	Instrumentation System Design	Intelligent and Autonomous Vehicles	Optimization Studies in Electrical Systems	Nano Sensors and Its Applications

PROGRAM ELECTIVE COURSES: VERTICLES

VERTICLE 1 – POWER ENGINEERING

S. No	Course Code	Course Title	L	T	P	No. of Contact Hours	C
1	EE606101	Conventional and Alternate Energy Sources	3	0	0	3	3
2	EE606102	Generation and Utilization of Electrical Energy	3	0	0	3	3
3	EE606103	Transmission and Distribution	3	0	0	3	3
4	EE606104	Flexible AC Transmission Systems	3	0	0	3	3
5	EE606105	High Voltage Engineering	3	0	0	3	3
6	EE606106	Power System Transients	3	0	0	3	3
7	EE606107	Power Quality	3	0	0	3	3
8	EE606108	Power System Planning	3	0	0	3	3
9	EE606109	Smart Grid: Basics to Advanced Technologies (NPTEL)	3	0	0	3	3
10	EE606110	Restructured Power Systems	3	0	0	3	3

VERTICLE 2 – CONVERTERS AND DRIVES

S. No	Course Code	Course Title	L	T	P	No. of Contact Hours	C
1	EE606201	Power Electronics for Renewable Energy Systems	3	0	0	3	3
2	EE606202	Control of Power Electronics Circuits	3	0	0	3	3
3	EE606203	Design of Switched Mode Power Supply	3	0	0	3	3
4	EE606204	Multilevel Power Converters	3	0	0	3	3
5	EE606205	Digital System Design (NPTEL)	3	0	0	3	3
6	EE606206	Advanced Power Electronics	3	0	0	3	3
7	EE606207	Design of Electrical Machines	3	0	0	3	3
8	EE606208	Analysis of Electrical Machines	3	0	0	3	3
9	EE606209	Analysis of Power Converters	3	0	0	3	3
10	EE606210	Modern Rectifiers and Resonant Converters	3	0	0	3	3

VERTICLE 3 – EMBEDDED SYSTEMS

S. No	Course Code	Course Title	L	T	P	No. of Contact Hours	C
1	EE606301	ARM Processors and Controllers	3	0	0	3	3
2	EE606302	Embedded Computing System Design	3	0	0	3	3

3	EE606303	Real Time Operating Systems	3	0	0	3	3
4	EE606304	Design of Embedded Systems	3	0	0	3	3
5	EE606305	Software for Embedded Systems	3	0	0	3	3
6	EE606306	Embedded Linux	3	0	0	3	3
7	EE606307	Embedded Control Systems Design	3	0	0	3	3
8	EE606308	Embedded Control for Electrical Drives	3	0	0	3	3
9	EE606309	Embedded System for Automotive Applications	3	0	0	3	3
10	EE606310	Embedded Product Development	3	0	0	3	3

VERTICLE 4 – CONTROL AND INTRUMENTATION

S. No	Course Code	Course Title	L	T	P	No. of Contact Hours	C
1	EE606401	Sensors and Actuators	3	0	0	3	3
2	EE606402	Industrial Instrumentation	3	0	0	3	3
3	EE606403	Medical Electronics	3	0	0	3	3
4	EE606404	Process Control	3	0	0	3	3
5	EE606405	Logic and Distributed Control System	3	0	0	3	3
6	EE606406	Industrial Data Networks	3	0	0	3	3
7	EE606407	Robotics and Automation	3	0	0	3	3
8	EE606408	Virtual Instrumentation	3	0	0	3	3
9	EE606409	Computer Control of Processes	3	0	0	3	3
10	EE606410	Instrumentation System Design	3	0	0	3	3

VERTICLE 5 – GREEN TRANSPORTATION

S. No	Course Code	Course Title	L	T	P	No. of Contact Hours	C
1	EE606501	Electric Vehicle Design	3	0	0	3	3
2	EE606502	Vehicle Dynamics and Control	3	0	0	3	3
3	EE606503	Modeling, Simulation and Control of Electric Vehicles	3	0	0	3	3
4	EE606504	Design of Motor and Power Converters for Electric Vehicles	3	0	0	3	3
5	EE606505	Design of Electric Vehicle Charging System	3	0	0	3	3
6	EE606506	Testing of Electric Vehicles	3	0	0	3	3
7	EE606507	Grid Integration of Electric Vehicles	3	0	0	3	3
8	EE606508	Fundamentals of Electric and Hybrid Vehicles	3	0	0	3	3
9	EE606509	Energy Storage and Management for Electric Vehicles	3	0	0	3	3
10	EE606510	Intelligent and Autonomous Vehicles	3	0	0	3	3

VERTICLE 6 – ELECTRICAL AND COMPUTATIONAL SCIENCES

S. No	Course Code	Course Title	L	T	P	No. of Contact Hours	C
1	CS640205	Object Oriented Programming Using Java	3	0	0	3	3
2	CS630204	Operating systems	3	0	0	3	3
3	CS630202	Data Structures Using C++	3	0	0	3	3
4	EE606601	Data Analysis Using Python for Electrical Engineers	3	0	0	3	3
5	EE606602	Data Management for Smart Grid	3	0	0	3	3
6	EE606603	Communication and Data Security in Electrical Engineering	3	0	0	3	3
7	EE606604	Communication Protocols, Security and Protection for Smart Grid	3	0	0	3	3
8	EE606605	PLC Programming	3	0	0	3	3
9	EE606606	Machine Learning	3	0	0	3	3
10	EE606607	Optimization Studies in Electrical Systems	3	0	0	3	3

VERTICLE 7 – DIVERSIFIED COURSES

S. No	Course Code	Course Title	L	T	P	No. of Contact Hours	C
1	EE606701	Hybrid Energy Technology	3	0	0	3	3
2	EE606702	Energy Efficient Buildings	3	0	0	3	3
3	EE606703	Bluetooth Technology	3	0	0	3	3
4	EE606704	Deep Learning	3	0	0	3	3
5	EE606705	Edge Computing	3	0	0	3	3
6	EE606706	Fuzzy Systems and Applications	3	0	0	3	3
7	EE606707	Municipal Solid Waste Management (NPTEL)	3	0	0	3	3
8	EE606708	Augmented Reality	3	0	0	3	3
9	EE606709	MEMS Technology	3	0	0	3	3
10	EE606710	Nano Sensors and Its Applications	3	0	0	3	3

INSTITUTE ELECTIVE COURSES OFFERED BY DEPARTMENT OF EEE

S. No	Course Code	Course Title	L	T	P	No. of Contact Hours	C
1	EE607108	Conventional and Non-Conventional Sources of Energy	3	0	0	3	3

2	EE607109	Electric Vehicles	3	0	0	3	3
3	EE607207	Hybrid energy technology	3	0	0	3	3
4	EE607208	Smart Grid Technology	3	0	0	3	3
5	EE607209	Instrumentation Systems	3	0	0	3	3
6	EE607308	Industrial Automation	3	0	0	3	3
7	EE607309	Process Control and Automation	3	0	0	3	3
8	EE607310	Automotive Embedded Systems and Applications	3	0	0	3	3
9	EE607407	Hybrid and Electric Vehicle Engineering	3	0	0	3	3
10	EE607408	Fuzzy Logic Controllers	3	0	0	3	3

SEMESTER V

EE650208- POWER SYSTEM ANALYSIS (PRACTICAL COMPONENT)					
Course Category: Program Core	**Course Type: Theory with Practical Component**	**L**	**T**	**P**	**C**
		2	**0**	**2**	**3**

COURSE OBJECTIVES:

- To introduce the overview of Power system analysis.
- To introduce the students about load flow analysis.
- To analyse the concepts on symmetrical fault analysis.
- To analyse the concepts on unsymmetrical fault analysis.
- To inspire the students for analysing stability analysis.

UNIT 1: LOAD FLOW ANALYSIS –I	**6**

Overview of power system analysis- single line diagram, per unit representation-Bus Admittance and impedance matrix formation-Importance of power flow analysis- Power flow problem – Classification of buses – development of power flow model in Gauss-seidel power flow-numerical problems

UNIT 2: LOAD FLOW ANALYSIS –II	**6**

Computation of transmission line flows, losses and slack bus power -Newton-Raphson (N-R) method (polar form)– flowchart – numerical problems – development of Fast Decoupled Power Flow (FDPF) model, flowchart, numerical problems – comparison of the three methods of load flow.

UNIT 3: SYMMETRICAL FAULT ANALYSIS	**6**

Need for fault analysis – common approximations made in fault analysis – symmetrical short circuits – Thevenin‘s equivalent circuit and its applications – short circuit capacity – circuit breaker selections – fault analysis using Z bus matrix-

UNIT 4: UNSYMMETRICAL FAULT ANALYSIS	**6**

Unsymmetrical short circuits – short circuit analysis – symmetrical components method – derivation of fault current – LG, LL, LLG short circuits – Phase shift due to star- delta transformers - Current limiting reactors.

UNIT 5: STABILITY ANALYSIS	**6**

Importance of stability analysis – classification of power system stability – single Machine Infinite Bus (SMIB) system – development of swing equation – synchronous machine representation by classical model – power – angle equation– equal area criterion – determination of critical clearing angle and time – algorithm for numerical solution of swing equation using modified Euler method – plotting of swing curves.

TOTAL: 30 PERIODS

PRACTICAL COMPONENT **15 PERIODS**

- Introduction to MATLAB and ETAP
- Ybus Formation Using Singular Transformation Method
- Load flow solution using Gauss – Seidal method
- Load flow solution using Newton – Raphson method
- Load flow solution using Fast Decoupled load flow method
- Z-BUS formation using bus building algorithm
- Gaussian Elimination method
- Symmetrical fault analysis
- Transient stability analysis using step by step algorithm

TOTAL: 30+15=45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1: Know the basics on per unit calculation and formation of Y-bus and Z-bus

CO2: Solve load flow problems using numerical methods

CO3: Analyse symmetrical faults and solving techniques.

CO4: Analyse Unsymmetrical faults and solving techniques.

CO5: Solve stability problems on power system and various numerical methods for

solving them.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	2	2-	2	2	2	2	2	1
CO2	3	3	3	3	-	2	2	2	2	2	2	2	2	2
CO3	3	3	3	3	2	2	2	2	2	2	3	2	2	2
CO4	3	3	3	3	1	2	2	2	2	2	2	2	2	2
CO5	3	3	3	3	3	2	2	1	2	2	2	2	2	2

TEXT BOOKS:

1. Ten, Chee-Wooi., Hou, Yunhe. Modern Power System Analysis. United States: CRC Press, 2024,Third Edition.
2. Hou, Yunhe. Electrical Power Transmission System Engineering: Analysis and Design. United States: CRC Press, 2024,Fourth Edition

REFERENCE BOOKS:

1. Glover, J. Duncan., Sarma, Mulukutla S, Overbye, Thomas J., Birchfield, Adam B.. Power System Analysis & Design. United States: Cengage, 2022,Seventh edition.
2. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, 3rd edition 2019.

WEB RESOURCES:

Power System Analysis

1.https://archive.nptel.ac.in/courses/108/105/108105067/

2. https://www.sciencedirect.com/book/9780081011119/power-systems-analysis

EE650209-POWER ELECTRONICS

Course Category: Program Core	**Course Type: Theory with Project**	**L**	**T**	**P**	**C**
		3	0	0	3

COURSE OBJECTIVES:

To impart knowledge on the following Topics,

- Characteristics of various power semiconductor switches and design their driver and protection circuits
- Operation and effect of various loads on rectifiers, inverters and AC-AC converters functioning
- Design and Analyse DC-DC isolated and non –isolated converters
- Different types of pulse width modulation schemes and Analyse power converters performance
- Role of power electronics in emerging areas of engineering applications

UNIT-1 - POWER SEMICONDUCTOR DEVICES **9**

Introduction-Review of power semiconductor switches: Power diodes, Thyristors: SCR, GTO-Power transistors: BJT, MOSFET, IGBT-Static and dynamic characteristics-Selection of switches - Design of snubber circuits, protection-isolation, Thermal modelling and design of heat sink.

UNIT-2 - CONTROLLED RECTIFIERS **9**

Design and analysis of single-phase half wave diode rectifier - Three phase full bridge diode rectifier- Phase controlled rectifiers: Design of single phase half-controlled rectifiers and Three phase half-controlled rectifiers- Effect of source inductance on controlled rectifiers - Twelve-pulse Rectifiers-Dual converters.

UNIT-3 – CHOPPERS **9**

Chopper operation and Control Strategies-Design and analysis of non-isolated converters with continuous, and discontinuous modes- non-ideal switches and converter performance –Design of isolated topologies- Converter selection, Multiport converters derivation.

UNIT-4 – INVERTERS	**9**
Voltage source inverters- Design of single-phase full bridge inverter- Three phase full bridge inverter - Power computations using Fourier series - Harmonic distortion analysis- Harmonic guidelines-Development of pulse-width modulation schemes - Significance of dead time-Current controlled inverter.	
UNIT-5 - AC-AC CONTROLLERS	**9**
Types of AC-AC voltage regulation-Design of single phase AC voltage controller- Analysis of three phase AC voltage controller - Single phase to single phase cyclo-converters-Matrix converter. Various power electronic applications: Power conditioners, UPS, HVDC, induction heating, speed control of induction motor, EV and renewable energy integration.	
TOTAL: 45 PERIODS	

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Understand the operation of semiconductor devices and dynamic characteristics
CO2	Analyze the various uncontrolled rectifiers and design suitable filter circuits
CO3	Understand various PWM techniques and apply voltage control and harmonic elimination methods to inverter circuits
CO4	Design and analysis of non-isolated converters with continuous, and discontinuous modes
CO5	Understand the operation of AC voltage controllers and its applications.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	3	2	2	2	2	3	3	3	3
CO2	3	3	3	3	3	2	-	1	3	2	2	2	3	3
CO3	3	3	3	3	2	3	2	2	2	1	2	-	3	3

CO4	3	3	3	3	1	2	1	2	1	2	2	3	3	3
CO5	3	3	3	3	2	2	1	2	2	2	2	3	3	3

1- Low, 2 - Medium, 3 - High, '-' No Correlation

TEXT BOOKS:

1. Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics - Converters, Applications and Design", Wiley India, third edition, 2022.

2. P.S.Bimbhra P.S., "Power Electronics", Khanna Publishers, sixth edition, 2018.

REFERENCE BOOKS:

1. Robert W. Erickson, Dragon Maksimovic, "Fundamentals of Power Electronics", Springer, third

Edition, 2020.

2. Daniel W.Hart, "Power Electronics", McGraw Hill Higher Education, 2017.4. Daniel W.Hart, "Power Electronics", McGraw Hill Higher Education, 2017.

WEB RESOURCES:

Multiport converters derivation.

1. https://www.sci-hub.se › dhananjaya2021 Power conditioners
2. https://nptel.ac.in/courses/108105066

EE650210 - INDUCTION AND SYNCHRONOUS MACHINES

Course Category: Program Core	**Course Type: Theory**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

To impart knowledge on the following Topics,

- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.

- Construction, principle of operation and performance of single phase induction motors and special machines.
- Construction and performance of salient and non – salient type synchronous generators.
- Principle of operation and performance of synchronous motor.

UNIT 1: THREE PHASE INDUCTION MOTOR	**9**

Constructional details – Rotor Types - Principle of operation – Slip –cogging and crawling. Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors –Induction generators – Synchronous induction motor- Applications

UNIT 2: STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR	**9**

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded Connection-V/f control – Slip power recovery Scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking- Applications

UNIT 3: SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES	**9**

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction motor – Repulsion motor - Hysteresis motor - AC series motor- Servo motors Stepper motors - introduction to magnetic levitation systems – Applications

UNIT 4: SYNCHRONOUS GENERATOR	**9**

Constructional details – Types of rotors –winding factors- EMF equation – Synchronous reactance – Armature reaction – Phasor diagrams of non-salient pole synchronous generator connected to infinite bus -Synchronizing and parallel operation – Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and A.S.A method – steady state powerangle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves- Applications

UNIT 5: SYNCHRONOUS MOTOR	**9**

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V

curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power Developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser- Applications

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Understand the construction and working principle of Three Phase Induction Motor
CO2	Acquire knowledge about the starting and speed control of induction motors.
CO3	Gain knowledge about the basic principles and working of Single phase induction motors
CO4	Understand the construction and working principle of Synchronous generator
CO5	Understand the construction and working principle of Synchronous Motor

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	2	2	3	1	2	2	2	2	2	2
CO2	3	3	2	3	2	3	3	-	2	3	2	2	2	2
CO3	3	3	2	3	2	2	2	1	2	2	3	1	2	3
CO4	3	3	2	3	2	2	2	2	2	-	3	-	2	2
CO5	3	3	2	2	1	2	2	1	1	2	2	1	2	2

1- Low, 2 - Medium, 3 - High, '-' No Correlation

TEXT BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 6th Education 2017.

2. Stephen J. Chapman, 'Electric Machinery Fundamentals'4th edition, McGraw Hill Education Pvt. Ltd, 4th Edition 2017.

REFERENCE BOOKS:

1. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.

2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, edition 2, 2021.

Web resources:

Electrical Machines

1 .https://archive.nptel.ac.in/courses/108/105/108105131/

2. http://digimat.in/nptel/courses/video/108105131/L86.html

EE 650305-POWER ELECTRONICS LABORATORY

Course Category: Program Core	**Course Type: Practical**	**L**	**T**	**P**	**C**
		0	0	3	1.5

COURSE OBJECTIVES:

To impart knowledge on the following Topics,

- VI Characteristics of SCR, TRIAC, MOSFET and IGBT.
- Performance of Semi Converter, Full Converter, Step-up, Step-down Choppers by Simulation and Experimentation.
- Behaviour of Voltage Waveforms of PWM Inverter Applying Various Modulation Techniques.
- Design and analyse the performance of SMPS.
- Performance of AC voltage controller by simulation and Experimentation

List Of Experiments:

1. Design of a Gate drive circuit for SCR / MOSFET / IGBT

2. Analyze gate pulse logic, modes of operation, verify the input and output waveforms of the single-phase AC-DC controlled converter

3. Analyze gate pulse logic, modes of operation, verify the input and output waveforms of the three-phase AC-DC controlled converter

4. Design a pulse-width modulated (PWM) buck/boost dc-dc converter operating in continuous-conduction mode (CCM)

5. Design and simulate/experiment the single-phase PWM inverter

6. Analysis gate pulse logic, modes of operation and simulate/experiment the Threephase inverter

7. Analyse gate pulse logic, modes of operation and simulate/experiment the AC-AC voltage controller

8. Analyse gate pulse logic, modes of operation and simulate/experiment the AC-AC frequency converter

9. Analyse the fundamental blocks in the Speed control of DC motor drive

10. Performance determination of DC motor drive under dynamic load

11. Speed control of poly-phase induction motor drive using V/f control

12. Speed control of wound rotor induction motor using static rotor resistance/slip power recovery scheme

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Determine the characteristics of SCR, IGBT, TRIAC, MOSFET and IGBT
CO2	Determine the transfer characteristics of full converter, semi converter, step up and step down choppers by simulation experimentation.
CO3	Analyse the voltage waveforms for PWM inverter using various modulation techniques.
CO4	Design and experimentally verify the performance of basic DC/DC converter topologies used for SMPS.
CO5	Analyse the performance of AC voltage controllers by simulation and experimentation

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	2	2	2	3	2	3	3
CO2	3	3	3	3	3	3	2	2	1	3	2	2	3	3
CO3	3	3	3	3	3	3	3	3	2	2	1	2	3	3
CO4	3	3	3	3	3	2	2	2	2	2	2	2	3	3
CO5	3	3	3	3	3	3	2	3	1	2	2	2	3	3

1- Low, 2 - Medium, 3 - High, '-' No Correlation

EE650306 - INDUCTION AND SYNCHRONOUS MACHINES LABORATORY

Course Category: Program Core	Course Type: Practical	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

To impart knowledge on the following Topics,

- The operation of various induction and synchronous machines and offer them speculative experimental skill in electrical machines

LIST OF EXPERIMENTS:

1. Load test on three-phase induction motor.

2. No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters.

3. Separation of No-load losses of three-phase induction motor.

4. Load test on single-phase induction motor.

5. No load and blocked rotor test on single-phase induction motor.

6. Study of Induction Motor Starters

7. Regulation of three phase alternator by EMF and MMF methods.

8. Regulation of three phase salient pole alternator by slip test.

9. Measurements of negative sequence and zero sequence impedance of alternators.

10. V and Inverted V curves of Three Phase Synchronous Motor.

TOTAL: 30 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1: Hands on experience of conducting various tests on induction motors and alternators for obtaining their performance indices using standard analytical as well as graphical methods.

CO2: Acquire knowledge on separation of losses

CO3: Understand and analyse EMF and MMF methods

CO4: Analyse the characteristics of V and Inverted V curves

CO5: Hands on experience of conducting various tests on alternators and obtaining their performance indices using standard analytical as well as graphical methods to understand the importance of Synchronous machines.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	2	3	3	3	1	2	2	2	2	3
CO2	3	2	2	2	3	2	3	2	1	2	2	2	3	2
CO3	2	2	2	2	3	3	2	1	1	3	3	1	3	3
CO4	2	3	3	3	2	3	3	2	1	2	2	2	2	2
CO5	2	2	2	2	3	2	2	3	1	2	2	2	2	2

1- Low, 2 - Medium, 3 - High, '-' No Correlation

EE650503 - INTEGRATED APTITUDE SKILLS - I (HIGHER)					
Course Category: EEC	Course Type: Skill Based Course	L	T	P	C
		0	0	2	1
COURSE OBJECTIVES: will be able to					

To impart knowledge on the following Topics,

- Solve aptitude, logical and questions.
- Excel the talents of students in logical Verbal reasoning Analysis
- The non-verbal Reasoning Analysis
- enable the students to speak and write in English without making any mistakes
- Excel the students in mock interview, group discussion.

UNIT 1: QUANTITATIVE APTITUDE	**6**

Percentage - Ratio & Proportions - Pipes & Cisterns - Permutations & Combinations - Partnership - Allegation (Or) Mixture - Races & Games - Stocks & Shares - Height & Distance - True Discount & Banker's Discount - Probability - Mensuration (Area, Volume & Surface Area) - Interest (Simple Interest, Compound Interest) - Logarithm - Chain Rule - Data Interpretation (Tabulation, Bar Chart, Pie Chart, Line Graphs)

UNIT 2: LOGICAL REASONING- VERBAL REASONING	**6**

Logic - Statement – Argument, Assumptions, Courses of action, Conclusion - Deriving Conclusion from passages - Theme Detection - Cause and Effect reasoning

UNIT 3: LOGICAL REASONING- NONVERBAL REASONING:	**6**

Series - Analogy - Classification - Analytical Reasoning - Mirror Images - Water Images - Spotting out the embedded figures - Completion of incomplete patterns - Figure Matrix - Paper Folding - Paper Cutting - Rule Detection - Grouping of identical figures - Cubes and Dice - Dot Situation - Construction of squares and triangles - Figure formation and analysis

UNIT 4: VERBAL ABILITY	6

Concord - Cloze Passage - Analogies or Reverse Analogies - Jumbled Sentences - Error

Deduction - Reading Comprehension - Paragraph Formation - Completing Statements - Usage of Prepositions - Inference - Verification of Truth from the Statements - Change of Speech

UNIT V: PRACTICALS	**6**

Extempore speech, Group Discussion, Mock Interview

TOTAL: 30 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Assess the basic concepts of quantitative ability.
CO2	Comprehend the basic concepts of verbal logical reasoning Skills.
CO3	Acquire satisfactory competency in use of nonverbal reasoning.
CO4	Comprehend the concepts in verbal ability
CO5	Acquire satisfactory competency in Group Discussion and Mock Interview

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	2	2	2	2	2	3	2	2	2	-	-
CO2	3	3	2	3	3	2	2	2	2	3	1	2	-	-
CO3	2	3	2	3	2	2	2	2	3	2	2	1	-	-
CO4	2	3	2	2	2	2	3	3	2	2	1	2	-	-
CO5	2	3	3	3	2	3	3	3	2	2	2	3	-	-

1- Low, 2 - Medium, 3 - High, '-' No Correlation

TEXT BOOKS:

1. Legal Aptitude & Reasoning for CLAT & AILET Exams. N.p., Disha Publications, 2021,second edition.

2.Agarwal R.S, "Quantitative Aptitude," S.Chand and Company Pvt. Ltd., New Delhi, First Edition 1989, Reprint, 2016

REFERENCE BOOKS:

1. Jaikishan, and Premkishan. How to Crack Test of Reasoning. India, Arihant Publication India Limited, first edition 2018.

2.Anand P A, "Quantitative Aptitude," Wiley India Pvt. Ltd., New Delhi, 2nd Edition, 2016

Web resources:

Aptitude Skills

1. https://www.udemy.com/course/quant_aptitud_tricks_and_shortcuts

Reasoning

2. https://aptitudeclass.com/

Practical Aptitude tests

3. http://www.practiceaptitudetests.com/

EE650801 - ENERGY AUDIT AND ENVIRONMENT MANAGEMENT

Course Category: Program Mandatory	Course Type: Theory	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

To impart knowledge on the following Topics,

- Concepts of energy fuels and its usage in electricity.
- Concepts energy conversion form resources
- Concept of forms of energy and its scenario.
- Concepts of energy policy at global, state and national level.

UNIT 1: GENERAL ASPECTS OF ENERGY AUDIT 6

Definition, energy audit, need, types of energy audit. Understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, smart metering. Roles and responsibilities of energy manager, accountability.

energy consumption, production, cumulative sum of differences (CUSUM) – Cost / Energy Share Diagram – Break Even Analysis.	
UNIT 2: ENERGY AUDIT IN MOTORS AND TRANSFORMERS	6
Losses in induction motors - factors affecting motor performance - variable speed drives - Energy audit procedures in induction motor and its drives - energy saving opportunities with energy efficient motors - soft starters with energy saver. Transformer – AVR & OLTC Concepts – Selection of Transformers – Performance Prediction - transformer losses Energy Efficient Transformers.	
UNIT 3: ENERGY AUDIT IN FAN, BLOWERS AND PUMPS	6
Fans and blowers: Types - efficient system operation - flow control strategies - energy audit procedures for fans and blowers - Pumps and Pumping System: Types - system operation - flow control methods - energy audit procedures in pumps.	
UNIT 4: ENERGY AUDIT IN LIGHTING SYSTEMS	6
Lighting System: Light source, choice of lighting, luminance requirements – ballast - occupancy sensors - energy efficient lighting controls - energy conservation case Studies.	
UNIT 5: ENVIRONMENTAL MANAGEMENT	6
Carbon Foot prints, Climate change and Global warming, Solar energy options for industries - clean development mechanism - Environmental management in industries - Future cleaner energy options	
TOTAL: 30 PERIODS	
COURSE OUTCOMES: At the end of the course, the student will be able to	
CO1	Understand the renewable energy source and non-renewable energy source
CO2	Express the concept of energy source conversion
CO3	Express the concept of depletion of energy resources and its impact on economy

CO4	Understand the sector wise energy consumption
CO5	Understand energy conversion act

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	3	2	2	2	2	2	2	2	2
CO2	3	1	1	2	3	2	3	3	3	2	2	-	2	2
CO3	3	1	2	1	2	2	3	3	3	-	3	1	3	2
CO4	3	2	2	2	2	3	2	2	3	1	2	2	3	2
CO5	2	2	2	1	-	2	2	2	2	2	2	2	3	3

1- Low, 2 - Medium, 3 - High, '-' No Correlation

TEXT BOOKS:

1. Energy Audit and Management: Concept, Methodologies, Procedures, and Case Studies. United States, CRC Press, 2022,second edition

2. Krutwig, Michael, and Dumitru Tanțău, Adrian. Energy Audits: Theoretical Examination and Modeling of Energy Audits. Germany, Springer Gabler, 2021, second Edition.

REFERENCE BOOKS:

1. Hansen, Shirley J., and Brown, James W. Investment Grade Energy Audit. United States, River Publishers, 2020,first edition.

2. Krarti, Moncef. Energy audit of building systems: an engineering approach. CRC press, 2020, second edition.

3. Thumann, Albert, et al. Handbook of Energy Audits, Ninth Edition. United Kingdom, River Publishers, 2020, second edition.

Web resources:

Energy Audit

1. https://onlinecourses.swayam2.ac.in/nou23_es05/preview

2. https://nptel.ac.in/courses/108106022

SEMESTER VI

EE660211- DIGITAL SIGNAL PROCESSING SYSTEM DESIGN		
Course Category: Program Core	**Course Type:** Theory with Practical Component	**L** **T** **P** **C** 2 0 2 3
COURSE OBJECTIVES:		

To impart knowledge on the following Topics,

- Concept of analyzing discrete time signals & systems in the time and frequency domain through mathematical representation.
- The various time to frequency domain transformation techniques.
- The computation algorithmic steps for Fourier Transform.
- Filters and their design for digital implementation.
- The programmable digital signal processor & its application.

UNIT 1: INTRODUCTION	**6**

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation.

UNIT II DISCRETE TIME SYSTEM ANALYSIS	**6**

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Introduction to Fourier Transform– Discrete time Fourier transform

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION	**6**

DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS	**6**

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping -Frequency transformation.

UNIT V DIGITAL SIGNAL PROCESSORS	**6**

Introduction – Architecture of one DSP processor for motor control – Features – Addressing Formats– Functional modes - Introduction to Commercial Processors

TOTAL: 30 PERIODS

LAB COMPONENTS: **30 PERIODS**

1. Laboratory exercise : Use any DSP processor/MATLAB/open source platform to give hands on training on basic concepts of Digital Signal Processing

a) To determine impulse and step response of two vectors

b) To perform convolution between two vectors.

c) To compute DFT and IDFT of a given sequence.

d) To perform linear convolution of two sequence using DFT

e) Design and Implementation of FIR Filter

f) Design and Implementation of IIR Filter

g) To determine z-transform from the given transfer function and its ROC

2. Implementation of FIR/IIR filter with FPGA.

3. DSP processors based Mini project.

TOTAL: 30+30 = 60 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Explain the concepts of digital signal processing
CO2	Illustrate the system representation using transforms
CO3	Learn the transformation techniques for time to frequency conversion
CO4	Design suitable digital FIR, IIR algorithm for the given specification
CO5	Use digital signal processor for application development.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	2	-	-	-	2	2	-	3	1	-
CO2	2	3	2	-	2	2	-	-	2	2	-	3	2	-
CO3	2	3	2	2	1	-	-	-	2	2	-	3	1	1
CO4	2	2	2	2	2	-	-	-	2	2	-	3	-	-
CO5	2	3	2	-	-	-	-	-	2	2	-	3	-	-

1- Low, 2 - Medium, 3 - High, '-' No Correlation

TEXT BOOKS:

1. Mneney, Stanley. An Introduction to Digital Signal Processing. Denmark, River Publishers, first edition 2022.
2. Digital Signal Processing,S.Salaivahanan,10th edition, McGraw Hill ,2019

REFERENCE BOOKS:

1. . Digital Signal Processing, McGraw Hill, P. Ramesh Babu, 7th Revised Edition,2011
2. Digital Signal Processing A.NagoorKani McGraw Hill 2 nd Edition, 2012

WEB RESOURCES:
Digital signal fundamentals 1.https://nptel.ac.in/courses/117102060

EE660212 -SOLID STATE DRIVES		
Course Category: Program Core	**Course Type:** Theory with Project	**L** **T** **P** **C** 3 0 0 3
COURSE OBJECTIVES:		
To impart knowledge on the following Topics, • Steady state operation and transient dynamics of a motor load system. • The operation of the converter / chopper fed dc drive, both qualitatively and quantitatively. • The operation and performance of AC Induction motor drives. • The operation and performance of AC Synchronous motor drives. • The current and speed controllers for a closed loop solid state DC motor drives.		
UNIT-1 - DRIVE CHARACTERISTICS		**9**
Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.		
UNIT-2 - CONVERTER / CHOPPER FED DC MOTOR DRIVE		**9**
Steady state analysis of the single and three phase converter fed separately excited DC motor drive – continuous and discontinuous conduction – Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive.		
UNIT-3 - INDUCTION MOTOR DRIVES		**9**
Stator voltage control – energy efficient drive – v/f control – constant air gap flux – field		

weakening mode – voltage / current fed inverter – closed loop control,

UNIT-4 - SYNCHRONOUS MOTOR DRIVES **9**

V/f control and self-control of synchronous motor: Margin angle control and power factor control –permanent magnet synchronous motor.

UNIT-5 - DESIGN OF CONTROLLERS FOR DRIVES **9**

Transfer function for DC motor / load and converter – closed loop control with current and speed feedback – armature voltage control and field weakening mode – design of controllers; current controller and speed controller-converter selection and characteristics.

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Understand the basic requirements of motor selection for different load profiles.
CO2	Analyse the steady state behaviour and stability aspects of drive systems.
CO3	Analyse the dynamic performance of the DC drive using converter and chopper control.
CO4	Simulate the AC drive.
CO5	Design the controller for electrical drives.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	3	2	3	2	3	2	2	2	3	3
CO2	3	2	2	3	3	2	2	2	2	3	2	2	3	3
CO3	3	2	2	3	3	3	3	3	3	2	3	2	2	2
CO4	3	2	2	3	3	2	2	2	2	2	-	2	1	2
CO5	3	2	2	3	3	2	3	3	3	-	-	2	2	3

1- Low, 2 - Medium, 3 - High, '-' No Correlation

TEXT BOOKS:

1. Pugazhendiran, P,Solid State Drives. India, Amazon Digital Services LLC - KDP Print US, First Edition, 2021.
2. 2. Solid State Drives (SSDs), Dr. R. Ramaprabha , Dr. R. Seyezhai ,Scitech Publications (India) Pvt Ltd, First Edition,2018.

REFERENCE BOOKS:

1. Underwood, Bertram. Understanding Solid State Drives: The Future of Storage. N.p., Amazon Digital Services LLC -,First Edition, Kdp, 2023.

2. Solid State Devices. United States, PHI Learning Pvt. Ltd., Second Edition,2018.

Web resources:

1. Self-control of synchronous motor

https://www.oreilly.com › library › view › Text › 06

2. https://archive.nptel.ac.in/courses/117/106/117106091/

EE670307 ELECTRICAL ESTIMATION, COSTING AND POWER WIRING LABORATORY

Course Category: Program Core	Course Type: Practical	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

To impart knowledge on the following Topics,

- To become familiar in estimation of electrical wiring and IE rules
- To get the training on usage of electrical standards and symbols
- To acquire knowledge in the field of costing for LT & HT wiring.
- To acquire knowledge in earthing and testing of installation.

LIST OF EXPERIMENTS:

1. Study on Conventional Symbols for various Wiring Items and Accessories.
2. Estimate the costing and quantity of materials required for residential single bedroom flat (1

BHK).

3. Estimate the costing and quantity of materials required for Industrial power wiring having 4 or 5 machines.
4. Estimate the costing and quantity of materials required for Erection of one no. 15 hp induction motor in saw mill/flour mill.
5. Estimate the costing and quantity of materials required for Irrigation Pump motor (5hp) wiring.
6. Estimate the costing and quantity of materials required for Computer centre having 10 computers, a/c unit, UPS, light and fan.
7. Estimate the costing and quantity of materials required for Street Light service having 12 lamp light fitting.
8. Estimate the costing and quantity of materials required for a residential solar PV system
9. Study on Earthing and testing of installation.
10. Estimate the costing and quantity of materials required for a pipe and plate earthing as per IS 3043, 1966.
11. Study on testing of Wiring Installation.
12. Estimate the costing and quantity of materials required for installing a distribution transformer.

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1: To understand usage of electrical standards and symbols

CO2: To learn the differences between the theoretical and practical usage of accessories.

CO3: To have adequate knowledge in the field of cost estimation of power wiring and installation.

CO4: To study the market strategy and live with real world.

CO5: To know about Earthing and Testing of installation

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	3	3	2	2	2	2	3
CO2	3	3	2	2	2	3	2	2	3	3	-	3	2	2

CO3	3	2	2	3	3	2	2	2	1	2	3	2	2	2
CO4	3	1	3	1	2	3	2	2	2	2	2	2	3	3
CO5	3	2	2	2	2	2	2	3	1	2	2	2	-	-

1- Low, 2 - Medium, 3 - High, '-' No Correlation

EE660504- ELECTRICAL COMPUTER AIDED DESIGN (ECAD)

Course Category: EEC	**Course Type: Skill Based Course**	**L**	**T**	**P**	**C**
		0	0	2	1

COURSE OBJECTIVES:

To impart knowledge on the following Topics,

- Linear and nonlinear dynamic electronic circuits using the computer.
- Concepts of network graph theory, generalized tableau and hybrid analysis, companion modeling.
- Concepts of Newton's method in n-dimensions,
- Numerical integration, sensitivity analysis
- The concepts of optimization.

LAB EXPERIMENTS

List of Experiments:

1. Design and Simulate Annotations, Link components by dashed lines, Creating Ladders and the concepts related to computer aided design of electrical equipment's

2.Design and Simulate Schematic Components, Editing, Connectors, Transmission line Formulate and solve the optimum design problems with computers.

3.Design and simulate Electric motor, generator Components, R, L, C Circuits design

4. Design and simulate Single Line Diagram

5. Design and simulate electrical circuit diagrams , layouts of substations

6. Design and simulate layouts of earthing systems.

7. Design and simulate 3D ECAD drawings

8. Design and simulate Limits, units, zoom, Gird, Snap, line, Isoplane and Ellipse

9. Design and simulate Solid editing, modelling

10. Design and simulate Transmission line, Electric Machine Isometric drawings

TOTAL: 30 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1: Establish the Electrical and Electronic designs using ECAD Software.

CO2: Analyse Error checking & automatic report generation for panel, schematic circuits.

CO3: Convert AutoCAD drawing to electrical CAD drawing.

CO4: Gain experience in electronic computer aided design (ECAD) through learning a design flow

CO5: Simulate and analyse Electrical Systems

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	-	1	-	3	-	-	2	-	3
CO2	3	3	2	-	2	-	1	-	3	2	2	-	2	2
CO3	3	2	2	3	2	-	-	2	1	2	2	1	2	2
CO4	3	1	3	1	3	-	-	2	2	1	2	2	3	3
CO5	3	2	2	2	3	-	-	2	1	2	1	1	-	-

1- Low, 2 - Medium, 3 - High, '-' No Correlation