E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A++' Grade | Accredited by NBA (BE- CIVIL, CSE, ECE, EEE, MECH & IT)

NAGAPATTINAM – 611 002

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Full Time Curriculum and Syllabus

Second Year – Fourth Semester

Course Code		Course Name	L	T	P	H	C	Maximum Marks		
								CA	ES	Total
Theory Course										
1	2302EE401	Generation, Transmission and Distribution	3	2	0	5	4	40	60	100
2	2302EE402	Electrical Machines -II	3	2	0	5	4	40	60	100
3	2302EE403	Power Electronics	3	0	0	3	3	40	60	100
4	2302EE404	Linear Control Systems	3	2	0	5	4	40	60	100
5	2301MC40X	Mandatory course-I	2	0	0	2	0	100	-	100
Theory Cum Laboratory Course										
6	2302EE405	Linear Integrated Circuits	3	0	2	5	4	50	50	100
7	2301HSX01	Universal Human Values and Ethics	1	0	2	3	2	50	50	100
Practical Course										
8	2302EE451	Electrical Machines –II Laboratory	0	0	2	2	1	60	40	100
9	2302EE452	Power Electronics Laboratory	0	0	2	2	1	60	40	100
10	2304GE401	Professional Development Course – II	0	0	2	2	1	100	-	100
11	2301LS401	Life Skills - IV	0	0	0	0	0	-	-	-
		Total	**18**	**06**	**10**	**34**	**24**	**580**	**420**	**1000**

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

2302EE401	GENERATION, TRANSMISSION AND DISTRIBUTION	L	T	P	C
		3	2	0	4

PREREQUISITE:

1	Electric Circuit Analysis

COURSE OBJECTIVES:

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1	To describe the principle of operation of generation, transmission and distribution system.
2	To learn about different insulators and underground cables
3	To study the line parameters and interference with neighboring circuits.
4	To understand the mechanical design and performance analysis of transmission lines.

COURSE OUTCOMES:

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

CO1:	Discuss the structure of power system, **power generation from renewable and non-renewable energy sources**
CO2:	Calculate the sag and tension of overhead lines and string efficiency of insulators
CO3:	**Compute the parameters of transmission lines, and underground cables**
CO4:	**Calculate the transmission efficiency and voltage regulation of a transmission line**
CO5:	Explain the distribution systems, substation and modern trends in transmission and distribution systems.

COs Vs POs MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	2	1	1	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	2	1	1	-	-	-	-	-	-	-	-	-

COs Vs PSOs MAPPING

COs	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-

COURSE CONTENTS:

MODULE I	**ELECTRICAL POWER GENERATION (Block diagram/Qualitative approach only)**	**12 Hours**

Structure of electric power system: Single line diagram- different operating voltages of generation, transmission and distribution- transmission line route survey (Marking diagrams in India map).
Types of energy and classification of power plants; Present power position in India, future planning for power generation.
Power generation from Non-Renewable energy sources: Thermal and Nuclear based power generation Power generation from Renewable energy sources: Solar, Wind, Hydro, Tidal, Geothermal, Fuel cell and Bio-mass based power generation.

MODULE II	**MECHANICAL DESIGN OF LINES, AND INSULATORS**	**12 Hours**

Mechanical design of OH lines: Line supports -types of towers - tension and sag calculation - towers at equal heights, unequal heights- effects of wind and ice loading- stringing chart; Methods of grounding.
Insulators: Types - voltage distribution in insulator string - improvement of string efficiency - testing of insulators.

MODULE III	**PARAMETERS OF TRANSMISSION LINES, AND UNDERGROUND CABLES**	**12 Hours**

Parameters of single and three phase transmission lines: Resistance, inductance of transmission lines- inductance of a single phase two wire line, inductance of three phase lines with symmetrical and unsymmetrical spacing; Capacitance of a single phase two wire line, capacitance of a three phase line with symmetrical and unsymmetrical spacing, **transposed, solid, stranded and bundled conductors; self**and mutual GMD.
Underground cables: Constructional features of LT and HT cables; Capacitance of single-core cable, capacitance of 3-core belted cable; Insulation resistance; potential gradient **- grading of cables; power factor and heating; DC cables- Cable standards and procedures-Cable faults and testing.**

MODULE IV	**PERFORMANCE OF TRANSMISSION LINES**	**12 Hours**

Performance of Transmission lines - short line, medium line and long line, equivalent circuits- Phasor diagram- attenuation constant- phase constant-surge impedance; Calculation of transmission efficiency and voltage regulation; Real and reactive power flow in lines; Surge impedance loading; Power circle diagrams; Skin and proximity effects, Ferranti effect; Interference with neighboring communication circuits; Corona discharge characteristics - Critical voltage and corona loss

MODULE V	**DISTRIBUTION SYSTEMS AND SUBSTATION**	**12 Hours**

Distribution systems: General Aspects-AC and DC distribution; Radial and ring main systems; Calculation of voltage in distributors with concentrated and distributed loads, Kelvin's law; Techniques of voltage control and power factor improvement.
Substation: Types- typical key diagram of an 11kV / 400V substation; Grounding; Recent trends in transmission and distribution: EHVAC, HVDC, GIS and FACTS (Qualitative treatment only).

TOTAL: 60 HOURS

REFERENCES:

1. D.P.Kothari, I.J. Nagarath, 'Power System Engineering', Mc Graw-Hill Publishing Company limited, New Delhi, Third Edition, 2019

2. C.L.Wadhwa, 'Electrical Power Systems', New Age International Ltd, seventh edition 2022
3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2008
4. B.R.Gupta, 'Power System Analysis and Design' S. Chand, New Delhi, Sixth Edition, 2011
5. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition, 23rd reprint, 2015
6. R.K.Rajput, 'A Text Book of Power System Engineering' 2nd edition, Laxmi Publications (P) Ltd, New Delhi, 2016
7. V.K.Mehta, Rohit Mehta, 'Principles of power system', S. Chand & Company Ltd, New Delhi, 2013.
8. https://nptel.ac.in/courses/108102047
9. https://nptel.ac.in/courses/108108099

2302EE402	ELECTRICAL MACHINES - II	L	T	P	C
		3	2	0	4

PREREQUISITE:

1. Electric Circuit Analysis
2. Electrical Machines -I

COURSE OBJECTIVES:

1. To impart the basic operation and construction of various AC machines.
2. To describe the performance of synchronous machine by different methods.
3. To analyze the performance characteristics and equivalent circuits of AC machines.

COURSE OUTCOMES:

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

CO1:	Investigate the percentage regulation of three-phase AC generator using various regulation methods.
CO2:	Inspect the performance characteristics of three-phase synchronous motor by conducting various test
CO3:	Identify the performance characteristics of three-phase induction motor by conducting OC and SC test
CO4:	Gain Knowledge about the concepts of starters & speed control methods
CO5:	Describe the characteristics behavior of various types of single-phase induction motor and special machines

COs Vs POs MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	2	2	1								
CO2	3	2	2	1	1							
CO3	3	2	2	1	1							
CO4	2	1			1							
CO5	2	1			1							

COs Vs PSOs MAPPING

COs	PSO1	PSO2	PSO3
CO1	3		
CO2	3		1
CO3	3		1
CO4	3		1
CO5	3		1

COURSE CONTENTS:

MODULE I	SYNCHRONOUS GENERATOR	12 Hours

Constructional details-types of rotors; EMF equation; Armature reaction-phasor diagram; Predetermination of voltage regulation– EMF, MMF, ZPF & ASA methods; Two reaction theory; Slip test; Parallel operation and synchronization to infinite bus bar; Application.

MODULE II	SYNCHRONOUS MOTOR	12 Hours

Principle of operation, torque equation, power input and power developed equations; V and Inverted V curves; Effect of varying load and Excitation; Load test and characteristics; Starting methods; Hunting; Synchronous condenser, Synchronous induction motor, Applications. Simple simulation studies on synchronous motor.		
MODULE III	**THREE PHASE INDUCTION MOTOR**	**12 Hours**
Constructional details- types- principle of operation- rotating magnetic field- slip; Equivalent circuit; Torque equation- Torque-Slip characteristics; No load & Blocked rotor test -Circle diagram, separation of losses; Cogging and crawling; Induction generator; Double cage deep bar induction motor. Introduction to AC drives in industry. Simple simulation studies of induction motor.		
MODULE IV	**STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR**	**12 Hours**
Need for starter - Types of starters – star delta starter, auto transformer starter, DOL starter- Comparison of starters; Speed control – voltage control, frequency control, pole changing, cascaded connection, v/f control, slip power recovery scheme; Braking methods; Speed control applications in industries; Study on PLC based star delta starter.		
MODULE V	**SINGLE PHASE INDUCTION MOTOR & SPECIAL MOTOR**	**12 Hours**
Principle of single-phase induction motor- Double field revolving theory- Equivalent circuit- Starting methods. Fractional HP motors- Hysteresis motor, Stepper motor; Universal motor; Linear induction motor, D.C. servo motor, PMSM motor, PMDC motor , BLDC motor; Study on PLC based special machines drive.		
TOTAL: 60 HOURS		

REFERENCES:

1. D. P. Kothari and I. J. Nagrath, Electric Machines, Tata McGraw Hill Publishing Company Ltd, 2010.
2. Edward Hughes, Electrical and Electronic Technology, 12th edition, Pearson, 2016.
3. P. S. Bimbhra, Electrical Machinery, Khanna Publishers, 7th edition, 2011.
4. B. L. Theraja and A. K. Theraja, ―Text Book of Electrical Technology: AC & DC Machines (Volume- 2),
5. M.N.Bandyopadhyay, Electrical Machines Theory and practice, PHI Learning Pvt. Ltd, New Delhi 2007.
6. Fitzgerald A.E, CharlesKingsley, Stephen. D.Umans, „Electric Machinery", Tata McGraw-Hill
7.http://nptel.ac.in/courses/117106086/

2302EE403	POWER ELECTRONICS	L	T	P	C
		3	0	0	3

PREREQUISITE:

1. Electron Devices and Circuits
2. Linear Integrated Circuits

COURSE OBJECTIVES:

1. To understand the characteristics of power semiconductor devices
2. To understand the operation of AC-DC, DC-DC, DC-AC and AC-AC power Converters

COURSE OUTCOMES:

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

CO1:	Describe the structure and characteristics of power semiconductor devices.
CO2:	Analyze the operation and performance of phase controlled converters.
CO3:	Examine the control techniques and operation of DC choppers
CO4:	Analyze the performance of inverter circuit and harmonic techniques
CO5:	Explain the operation and characteristics of AC - AC converters.

COs Vs POs MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	-

COs Vs PSOs MAPPING

COs	PSO1	PSO2	PSO3
CO1	-	3	-
CO2	-	3	-
CO3	-	3	-
CO4	-	3	-
CO5	-	3	-

COURSE CONTENTS:

MODULE I	**POWER SEMICONDUCTOR DEVICES**	**9 Hours**

Study of switching devices - Power transistors, Power MOSFETs, IGBTs, SCRs, Triacs, GTOs; Static and Dynamic characteristics; Thermal characteristics; losses in the devices.

SCRs- Two transistor analogy; Snubber circuits; Series and parallel operation of SCRs; Data sheet interpretation of commercially available SCRs

MODULE II	**PHASE CONTROLLED CONVERTERS**	**9 Hours**

Principle of phase control; Single phase and three phase half wave and full wave converters with R, RL and RLE loads; Estimation of average and RMS values of load voltage, load current; Performance parameters for converters; Effect of freewheeling diodes; Effect of source inductance; Dual converters; Applications.

MODULE III	**DC TO DC CONVERTERS**	**9 Hours**

DC choppers: Principle of step-up and step-down choppers, control strategies; Classification of choppers- Single quadrant, two quadrant and four quadrant DC choppers, Buck, Boost and Buck boost converters; SMPS; LUO converter; SEPIC converter; Applications.

MODULE IV	**INVERTERS**	**9 Hours**

Types of inverters; Operation of single phase VSI, three phase VSI (120 and180-degree modes); Inverter output voltage control; CSIs- Auto sequential CSI; Pulse width modulation techniques- Single, multiple, sinusoidal modulation; Harmonic elimination techniques - SHEPWM; Introduction to MLIs; Applications.

MODULE V	**AC TO AC CONVERTERS**	**9 Hours**

AC voltage controllers-Single phase and three phase controllers with R and RL loads; Sequence control of AC regulators –Two stage sequence control - Multistage sequential control.

Cycloconverters: Step-down and step-up cyclo converters; Introduction to matrix converters; Applications.

TOTAL: 45 HOURS

REFERENCES:

1. Rashid M H, “Power Electronics- Circuits, Devices and Applications”, Prentice Hall of India, New Delhi, 2011.
2. P.S.Bimbhra, “Power Electronics”, Khanna Publishers, New Delhi, 2006.
3. Vedam Subramanyam, “Power Electronics”, New Age International, New Delhi, 1996.
4. M.D. Singh and K.B. Khanchandani, “Power Electronics”, 2nd Edition, Tata McGraw Hill, New
5. Ned Mohan, Tore.M.Undeland, William.P.Robbins, “Power Electronics: Converters,
6. https://nptel.ac.in/courses/108/102/108102145/

2302EE404	LINEAR CONTROL SYSTEM	L	T	P	C
		3	2	0	4

PREREQUISITE:

1. Electric circuit analysis
2. Engineering Mathematics
3. Engineering Physics

COURSE OBJECTIVES:

1. To understand the basic components of control systems.
2. To gain the knowledge in time and frequency domain tools for the design and analysis of Feedback control systems.
3. To make the students to analyze the stability of linear systems in the frequency domain.
4. To understand the design of compensator and concepts of state variable analysis.

COURSE OUTCOMES:

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

CO1:	Calculate transfer function of various systems using block diagram reduction, signal flow graphtechnique.
CO2:	Investigate the time response behavior of first and second order system using time domainspecification.
CO3:	Analyze the frequency response of open loop transfer function using bode plot and polar plot.
CO4:	Make use of stability concepts to obtain the desired characteristics
CO5:	Determine the solution for complex control problem.

COs Vs POs MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	2	1	-	2	-	-	-	-	-	-	-
CO2	3	2	1	-	2	-	-	-	-	-	-	-
CO3	3	2	1	-	2	-	-	-	-	-	-	-
CO4	3	2	1	-	2	-	-	-	-	-	-	-
CO5	3	2	1	-	2	-	-	-	-	-	-	-

COs Vs PSOs MAPPING

COs	PSO1	PSO2	PSO3
CO1	3	-	2
CO2	3	-	2
CO3	3	-	2
CO4	3	-	2
CO5	3	-	2

COURSE CONTENTS:		
MODULE I	**SYSTEMS AND THEIR REPRESENTATION**	**12 Hours**
Basic elements in control systems; Open and closed loop systems; Transfer function- Electrical and mechanical transfer function models; electrical analogy of mechanical systems, block diagram reduction techniques, signal flow graphs; Simple determination of closed loop transfer function using MATLAB.		
MODULE II	**TIME RESPONSE ANALYSIS**	**12 Hours**
Time response-Time domain specifications, types of test inputs, first and second order system responses; steady state error; type number; Simple time response analysis using MATLAB.		
MODULE III	**FREQUENCY RESPONSE ANALYSIS**	**12Hours**
Frequency response –Frequency domain specifications, Bode plot, polar plot, determination of closed loop response from open loop response; Correlation between frequency domain and time domain specifications; Simple frequency response analysis using MATLAB.		
MODULE IV	**STABILITY ANALYSIS**	**12 Hours**
Stability- Concept, relative stability, characteristics equation, Routh Hurwitz criterion, Nyquist stability criterion. Introduction to compensators-Lag, Lead and Lag-lead compensators; simple Nyquist plots using MATLAB.		
MODULE V	**DESIGN OF CONTROLLERS AND SYSTEM ANALYSIS**	**12 Hours**
Controllers - P, PI and PID controllers, design procedure, tuning of controllers - Root locus concept, Root locus construction; Simple root locus curves in MATLAB.		
		TOTAL: 60 HOURS

REFERENCES:

1. Nagarath, I.J. and Gopal, M., “Control Systems Engineering”, New Age InternationalPublishers, 2017.
2. S.K.Bhattacharya, “Control System Engineering”, 3rd Edition, Pearson Publications, New Delhi 2013.
3. K.Ogata, “Modern Control Engineering”, 5th Edition, Pearson Prentice Hall, New Delhi, 2012.
4. Richard C.Dorf and Robert H. Bishop, “Modern Control Systems”, 12th Edition, Pearson Prentice Hall, 2012.Benjamin C. Kuo, “Automatic Control Systems”, Wiley, 2014.
5. Benjamin C. Kuo, “Automatic Control Systems”, Wiley, 2014.
6. https://nptel.ac.in/courses/107106081
7. https://cosmolearning.org/courses/control-engineering/
8. https://library.villanova.edu/Find/Record/1437935/TOC

2302EE405	LINEAR INTEGRATED CIRCUITS	L	T	P	C
		3	0	2	4

PREREQUISITE:

1. Electric circuit Analysis
2. Analog Electronics

COURSE OBJECTIVES:

1	To understand the fundamentals and fabrication of ICs.
2	To explain the functions, characteristics and applications of op. amp.
3	To describe operation of signal converters, special function ICs and voltage regulators

COURSE OUTCOMES:

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

CO1:	Explain the fundamentals of IC technology and fabrication procedure for diode, capacitance, resistance, FET and typical circuits
CO2:	Describe the functional block diagram, performance parameters and frequency compensation techniques of operational amplifier
CO3:	Construct analog circuits using operational amplifier for linear and non-linear applications.
CO4:	Build signal conversion circuits and filters using operational amplifier.
CO5:	Design simple analog circuits for the given application using timer, VCO, PLL and voltage regulator ICs

COs Vs POs MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-

COs Vs PSOs MAPPING

COs	PSO1	PSO2	PSO3
CO1	-	3	-
CO2	-	3	-
CO3	-	3	-
CO4	-	3	-
CO5	-	3	-

COURSE CONTENTS:

MODULE I	**FABRICATION OF INTEGRATED CIRCUITS**	**9 Hours**

IC classification; Fundamental of monolithic IC technology; Epitaxial growth- masking and etching-diffusion of impurities; realization of monolithic ICs and packaging; Fabrication of diodes, capacitance, resistance and FET.

MODULE II	**OPERATIONAL AMPLIFIER**	**9 Hours**

Op-Amp- functional block diagram, ideal and practical op-amp; IC741- Pin diagram- Features- Interpretation of IC 741 datasheet; Characteristics- CMRR, open loop gain, slew rate; transfer characteristics, input bias and output offset voltage, offset compensation techniques; frequency response characterization, frequency compensation.

MODULE III	**APPLICATIONS OF OPERATIONAL AMPLIFIERS**	**9 Hours**

Inverting and non-inverting amplifiers- voltage follower- summing amplifier- differential amplifier- instrumentation amplifier; Comparators; Integrator and differentiator; Precision rectifier; Logarithmic and anti logarithmic amplifiers. Sinusoidal oscillators - phase shift, Wein bridge & Hartley; sample and hold circuit; clipper and clamper; Schmitt trigger.

MODULE IV	**SIGNAL CONVERSION CIRCUITS**	**9 Hours**

V/F and F/V converters; V/I and I/V converter; D/A converter - weighted resistor type, R-2R ladder type, inverted R-2R, comparison; A/D converters- flash type, successive approximation type, single slope type, dual slope type, A/D converter using voltage-to-time conversion, comparison.

MODULE V	**SPECIAL FUNCTION INTEGRATED CIRCUITS**	**9 Hours**

555 Timer - functional block diagram and description- astable, monostable and bistable operations; 566 voltage controlled oscillator; 565 PLL - functional block diagram, principle of operation, characteristics; IC voltage regulators – regulation, need for voltage regulation; LM78XX, 79XX fixed voltage regulators; LM 317 & LM723; Interpretation of IC data sheets.

TOTAL: 45 HOURS

LIST OF EXPERIMENTS:

1. Inverting and non-inverting amplifiers using op-amp.
2. Adder, subtractor and comparators using op-amp.
3. Weighted resistor type DAC and R-2R ladder type DAC
4. Sinusoidal oscillators using op-amps.
5. Astable and monostable multivibrators using NE555 timer.

TOTAL: 15 HOURS

TOTAL:(45+15) 60 HOURS

REFERENCES:

1. D Roy Choudhury and SheilB.Jani, “Linear Integrated Circuits” 4th Edition, New Age International, New Delhi, 2014.

2. S Salivahanan and V S KanchanaBhaaskaran, “Linear Integrated Circuits”, 2nd Edition, McGraw-Hill Education, 2014.
3. RamakantA.Gayakward, “Op-amps and Linear Integrated Circuits”, 4thEdition, PHI Learnings, 2003.
4. B Somanathan Nair, “Linear Integrated Circuits: Analysis, Design and Applications”, Wiley, 2009.
5. Floyd and Buchla, “Fundamentals of Analog Circuits”, Pearson, 2013.
6. James M. Fiore, “Operational Amplifiers & Linear Integrated Circuits: Theory and Application / 3E”, 2018.
7. Microelectronic circuits-by A.S.Sedra and K.C.Smith
8. http://nptel.ac.in/courses/117107094/

2302EE451	ELECTRICAL MACHINES – II LABORATORY	L	T	P	C
		0	0	2	1

PREREQUISITE:

1. Electrical Machines –I Laboratory

COURSE OBJECTIVES:

1. To know the performance characteristics of induction motors.
2. To compare various regulation methods of Synchronous machines.
3. To study the characteristics of brushless DC motor.

COURSE OUTCOMES:

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

CO1:	Investigate various regulation methods of synchronous machines by conducting OC and SC test
CO2:	Compute the performance characteristics of single phase / three-phase induction motor by conducting Load, no load and blocked rotor test
CO3:	Identify the performance characteristics of three-phase/single -phase induction motor by conducting OC and SC test
CO4:	Compute the load sharing of synchronous machines with bus bar
CO5:	Analyze the behavior of special machine Drives using PLC

COs Vs POs MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	3	3	3	-	-	-	-	2	2	2	-
CO2	3	3	3	3	-	-	-	-	2	2	2	-
CO3	3	3	3	3	-	-	-	-	2	2	2	-
CO4	3	3	3	3	-	-	-	-	2	2	2	-
CO5	3	3	3	3	2	-	-	-	2	2	2	

COs Vs PSOs MAPPING

COs	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	2

COURSE CONTENTS:

1.	Voltage regulation of an alternator by EMF and MMF method.
2.	Voltage regulation of an alternator by ZPF and ASA method.
3.	Determination of Xd, Xq and regulation of a salient pole alternator.
4.	Parallel operation of alternators/ synchronization of alternator with infinite bus bar.

5.	No load, blocked rotor test on three phase induction motor a) Circle Diagram. b) Equivalent Circuit.
6.	Load Test on three-phase induction motor.
7.	Separation of no load losses of three-phase induction motor.
8.	No load, blocked rotor test on single phase induction motor – Equivalent Circuit.
9.	Load Test on single-phase induction motor.
10.	PLC based Special Machine Drive (BLDC).
11.	Demonstration on PLC based Star – Delta starter.
	TOTAL: 30 HOURS

REFERENCES:

1. Kothari.D.P&Umre.B.S "Laboratory manual for electrical machines", I.K international Publishing House (P)Ltd. 2nd Edition, 2017

2302EE452	POWER ELECTRONICS AND DRIVES LABORATORY	L	T	P	C
		0	0	2	1

PREREQUISITE:

1. Power Electronics
2. Electrical Machinery – I &II

COURSE OBJECTIVES:

1. To determine the characteristics of power electronic devices.
2. To design a power converter for electrical drives.
3. To analyze the performance of power converter fed drives.

COURSE OUTCOMES:

	After completion of the course, Student will be able to
CO1	Construct experiments on power electronic component for obtaining characteristics curve
CO2	Design and test AC-DC and AC-AC converters
CO3	Design and test chopper and inverter circuits
CO4	Design pulse generation circuits for power electronic converters
CO5	Evaluate the performance of power converters through simulation

COs Vs POs MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	3	3	3	-	-	-	-	2	2	2	-
CO2	3	3	3	3	-	-	-	-	2	2	2	-
CO3	3	3	3	3	-	-	-	-	2	2	2	-
CO4	3	3	3	3	-	-	-	-	2	2	2	-
CO5	3	3	3	3	3	-	-	-	2	2	2	-

COs Vs PSOs MAPPING

COs	PSO1	PSO2	PSO3
CO1	-	3	-
CO2	-	3	-
CO3	-	3	-
CO4	-	3	-
CO5	-	3	3

LIST OF EXPERIMENTS

1. Switching characteristics of SCR, Triac and IGBT.
2. Performance evaluation of single phase half wave and full wave AC – DC controlled converter drive application.
3. Performance evaluation of three phase half wave and full wave AC – DC controlled converter drive application.
4. Step down, step up and Multi-quadrant MOSFET-based choppers.
5. IGBT-based single phase PWM inverter.

6. IGBT-based three-phase PWM inverter fed three phase AC Motor.	
7. Gate Pulse Generation using digital programming circuits for DC – DC converter & single-phase inverter.	
8. Performance evaluation of single phase AC voltage controller.	
9. V/F control of induction motor drive.	
10. Simulation of PE circuits (1Φ & 3Φ semi converter, full converters, DC-DC converters and inverter).	
TOTAL:	**30 Hours**

REFERENCES:

1. K.Nandakumar, R.Anandaraj, "Power Electronics and Drives Laboratory Manual", 2018
2. Krishnan.R, "Electric Motor and Drives Modeling, Analysis and Control", Prentice Hall of India, 2001.
3. Pillai, S.K., "A First Course on Electrical Drives", Wiley Eastern Limited, 1993.