SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

INSTITUTE VISION

To emerge as a Centre of Excellence for Learning and Research in the domains of engineering, computing and management.

INSTITUTE MISSION

IM1: Provide congenial academic ambience with state -of -art of resources for learning and research.

IM2: Ignite the students to acquire self-reliance in the latest technologies.

IM3: Unleash and encourage the innate potential and creativity of students.

IM4: Inculcate confidence to face and experience new challenges.

IM5: Foster enterprising spirit among students.

IM6: Work collaboratively with technical Institutes / Universities / Industries of National and International repute.

DEPARTMENT VISION

To impart innovative technical education with global standards, inculcate high pattern of discipline, thereby cultivating Electrical and Electronics Engineering students technologically prominent and ethically strong to meet the challenges of the society.

DEPARTMENT MISSION

DM1: Provide congenial academic ambience with necessary infrastructure and learning resources.

DM 2: Inculcate confidence to face and experience new challenges from industry and society.

DM 3: Ignite the students to acquire self-reliance in State-of-the-Art Technologies

DM 4: Foster Enterprising spirit among students

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

PEO1: To apply the technical knowledge in the field of Electrical and Electronics Engineering to pursue higher studies or in their professional career.

PEO2: To demonstrate technical knowledge to analyze, design, develop, optimize, and implement complex electrical systems.

PEO3: To gain multidisciplinary knowledge through projects and industrial training, providing a sustainable competitive edge in R&D and meeting industrial needs in the field of Electrical and Electronics Engineering.

PROGRAM SPECIFIC OUTCOMES (PSO'S)

PSO1: Ability to design, analyze and solve problems in the field of Electrical & Electronics Engineering by applying knowledge acquired from Electrical Power Systems, Electrical Machines, Control Systems, Power Electronics and Field theory

PSO2: To excel in current technologies, important to electrical engineering, as well as probable future technological advances & contribute actively to the field by participating in professional societies, attending technical events, doing research, pursuing higher education.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

Computer Science and Engineering Graduates will be able to:

PO1 - **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering Fundamentals, and an engineering specialization for the solution of complex engineering problems.

PO2 - **Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 - 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 public health and safety, and cultural, societal, and environmental considerations.

PO4 - 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.

PO5 - Modern tool usage: Ability to design and develop hardware and software in emerging technology environments like cloud computing embedded products, real-time systems, Internet of Things, Big Data etc.

PO6- Engineering 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.

PO7- 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.

PO8- Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - Communication: Communicate effectively on complex engineering activities with the engineering community and with the 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.

PO11 - 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.

PO12 - Life-long learning: Basic knowledge in hardware/software methods and tools for solving real-life and R&D problems with an orientation to lifelong learning.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE STRUCTURE

III.B.Tech. I Sem.

S.No	Subject Code	Subjects	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18EEE311	Switchgear and Protection	PC	3	-	-	3	30	70	100
2	18EEE312	Distribution of Electric Power	PC	3	-	-	3	30	70	100
3	18EEE313	Control Systems	PC	2	1	-	3	30	70	100
4	18EEE314	Electrical Machines-II	PC	2	1	-	3	30	70	100
5	18ECE318	IC Applications	ES	2	1	-	3	30	70	100
6	18EEE315	Power System Analysis	PC	2	1	-	3	30	70	100
7	18EEE316	Electrical Machines Lab-II	PC	-	-	2	1	30	70	100
8	18EEE317	Control system and simulation Lab	PC	-	-	2	1	30	70	100
9	18SAH311	Communication and Soft Skills Lab	HS	-	-	2	1	30	70	100
10	MOOC	Massive Online Open Course	OE	-	-	-	-	-	-	-
Contact hours per week				14	4	6	-	-	-	-
Total hours per week				24			-	-	-	-
Total credits (6 Theory + 3 Labs)							21	-	-	-
Total Marks								270	630	900

III.B.Tech. II Sem.

S.No	Subject Code	Subjects	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18MBA321	Principles of Management	ES	3	-	-	3	30	70	100
2	18EEE321	System Theory	PC	2	1	-	3	30	70	100
3	18EEE322	Power Electronics	PC	2	1	-	3	30	70	100
4	18EEE323	Electrical Machines -III	PC	2	1	-	3	30	70	100
5	18EEE324	Electrical & Electronics Measurements	PC	3	-	-	3	30	70	100
6	**OE-I**	**Open Elective-I**	OE	3	-	-	3	30	70	100
7	18EEE325	Power Electronics and simulation Lab	PC	-	-	2	1	30	70	100
8	18EEE326	Electrical and Electronics Measurements Lab	PC	-	-	2	1	30	70	100
9	18EEE327	Project Skills Lab	PW		-	2	1	30	70	100
10	18EEE328	On-line Comprehensive Test-II	PC	1	-	-	1	-	100	100
Contact hours per week				16	3	6	-	-	-	-
Total hours per week				25			-	-	-	-
Total credits (6 Theory + 3 Labs+1 OCT)							22	-	-	-
Total Marks								270	730	1000

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV.B.Tech. I Sem.

S.No	Subject Code	Subjects	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18EEE411	Power System Operation And Control	PC	2	1	-	3	30	70	100
2	18EEE412	Special Electrical Machines	PC	3	-	-	3	30	70	100
3	18ECE418	Microprocessors and Interfacing	ES	3	-	-	3	30	70	100
4	18EEE413	**Core Elective-I**	CE	3	-	-	3	30	70	100
5	18EEE414	**Core Elective-II**	CE	3	-	-	3	30	70	100
6	OE-II	**Open Elective-II**	OE	3	-	-	3	30	70	100
7	18ECE419	Microprocessors and Interfacing Lab	ES	-	-	2	1	30	70	100
8	18EEE415	Power System and Simulation Lab	PC	-	-	2	1	30	70	100
9	18AUD411	Professional Ethics	AC	2	-	-	-	-	-	-
Contact hours per week				19	1	4	-	-	-	-
Total hours per week				24			-	-	-	-
Total credits (6 Theory + 2 Labs)							20	-	-	-
Total Marks								240	560	800

IV.B.Tech. II Sem.

S.No	Subject Code	Subjects	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18EEE421	Control of Electrical Drives	PC	3	-	-	3	30	70	100
2	18EEE422	Power Electronics for Renewable Energy System	PC	3	-	-	3	30	70	100
3	18EEE423	**Core Elective-III**	CE	3	-	-	3	30	70	100
4	18EEE424	**Core Elective-IV**	CE	3	-	-	3	30	70	100
5	18EEE425	Project Work	PW	-	-	20	10	30	70	100
Contact hours per week				12	-	20	-	-	-	-
Total hours per week				32			-	-	-	-
Total credits (4 Theory + 1 Project Work)							22	-	-	-
Total Marks								150	350	500

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CORE ELECTIVES

IV.B.Tech. I Sem. (Core Elective-I)

S.No	Subject Code	Subjects	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18EEE413A	Power Quality	CE	3	-	-	3	30	70	100
2	18EEE413B	HVDC Transmission Systems	CE	3	-	-	3	30	70	100
3	18EEE413C	Digital Control Systems	CE	3	-	-	3	30	70	100
4	18EEE413D	Power System Economics	CE	3	-	-	3	30	70	100
5	18EEE413E	Power System Dynamics	CE	3	-	-	3	30	70	100
6	18EEE413F	Gas Insulated systems and Substations	CE	3	-	-	3	30	70	100

IV.B.Tech. I Sem. (Core Elective-II)

S.No	Subject Code	Subjects	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18EEE414A	Nonconventional Energy Sources	CE	3	-	-	3	30	70	100
2	18EEE414B	Power System Dynamics And Control	CE	3	-	-	3	30	70	100
3	18EEE414C	Renewable Power Generation and Control	CE	3	-	-	3	30	70	100
4	18EEE414D	Control System Design	CE	3	-	-	3	30	70	100
5	18EEE414E	Energy Auditing and Demand Side Management	CE	3	-	-	3	30	70	100
6	18EEE414F	Electric Vehicles	CE	3	-	-	3	30	70	100

IV.B.Tech. II Sem. (Core Elective-III)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18EEE423A	Utilization of Electrical Energy	CE	3	-	-	3	30	70	100
2	18EEE423B	Smart Grid	CE	3	-	-	3	30	70	100
3	18EEE423C	Flexible AC Transmission System	CE	3	-	-	3	30	70	100
4	18EEE423D	Electrical Machine Design	CE	3	-	-	3	30	70	100
5	18EEE423E	Power System Transients	CE	3	-	-	3	30	70	100
6	18EEE423F	Programmable Logic Controllers and Applications	CE	3	-	-	3	30	70	100

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV.B.Tech. II Sem. (Core Elective-IV)

S.No	Subject Code	Subjects	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1	18EEE424A	Industrial Automation	CE	3	-	-	3	30	70	100
2	18EEE424B	Electrical Design Systems	CE	3	-	-	3	30	70	100
3	18EEE424C	Microcontroller Based System Design	CE	3	-	-	3	30	70	100
4	18EEE424D	Advanced Power Semiconductor Devices	CE	3	-	-	3	30	70	100
5	18EEE424E	EHVAC Transmission	CE	3	-	-	3	30	70	100
6	18EEE424F	Surge Phenomenon and Insulation Co-ordination	CE	3	-	-	3	30	70	100

OPEN ELECTIVE-I

III.B.Tech. II Sem.

Offered Department	Subject Code	Subject	Subject Category	Scheme of Instructions Periods per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
S&H	18OSAH321	Mathematical Modeling - Analysis and Applications	OE	3	-	-	3	30	70	100
	18OSAH322	Business Communication and Career Skills	OE	3	-	-	3	30	70	100
	18OSAH323	Laser and Fiber Optics	OE	3	-	-	3	30	70	100
CSE	18OCSE321	Object Oriented Programming	OE	3	-	-	3	30	70	100
	18OCSE322	Operating Systems	OE	3	-	-	3	30	70	100
	18OCSE323	WEB Programming	OE	3	-	-	3	30	70	100
CIV	18OCIV321	Construction and Project Management	OE	3	-	-	3	30	70	100
	18OCIV322	Remote Sensing and GIS	OE	3	-	-	3	30	70	100
	18OCIV323	Green Buildings and Energy Conservation	OE	3	-	-	3	30	70	100
MECH	18OMEC321	Industrial Robotics	OE	3	-	-	3	30	70	100
	18OMEC322	Power Plant Technology	OE	3	-	-	3	30	70	100
	18OMEC323	Mechatronics System	OE	3	-	-	3	30	70	100
ECE	18OECE321	Machine Vision System	OE	3	-	-	3	30	70	100
	18OECE322	Foundation of NANO Electronics	OE	3	-	-	3	30	70	100
	18OECE323	Medical Electronics	OE	3	-	-	3	30	70	100

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

OPEN ELECTIVE-II

IV.B.Tech. I Sem.

Offered Department	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
S&H	18OSAH411	Graph Theory With Applications	OE	3	-	-	3	30	70	100
	18OSAH412	Banking and Insurance	OE	3	-	-	3	30	70	100
	18OSAH413	Managing Innovation and Entrepreneurship	OE	3	-	-	3	30	70	100
CSE	18OCSE411	Fundamentals of DBMS	OE	3	-	-	3	30	70	100
	18OCSE412	Basics of Internet of Things	OE	3	-	-	3	30	70	100
	18OCSE413	Information Security	OE	3	-	-	3	30	70	100
CIV	18OCIV411	Transport and Environment	OE	3	-	-	3	30	70	100
	18OCIV412	Disaster Management	OE	3	-	-	3	30	70	100
	18OCIV413	Air Pollution and Control Engineering	OE	3	-	-	3	30	70	100
MECH	18OMEC411	Quality Control Reliability Engineering	OE	3	-	-	3	30	70	100
	18OMEC412	Industrial Engineering and Psychology	OE	3	-	-	3	30	70	100
	18OMEC413	3D Printing and Design	OE	3	-	-	3	30	70	100
ECE	18OECE411	Fundamental of Artificial Intelligence	OE	3	-	-	3	30	70	100
	18OECE412	Fundamental of Embedded Systems	OE	3	-	-	3	30	70	100
	18OECE413	Data Communication and Networks	OE	3	-	-	3	30	70	100

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SUMMARY OF CREDIT ALLOCATION

S.NO	SUBJECT AREA	CREDITS AS PER SEMESTER								TOTAL CREDITS
		I-I	I-II	II-I	II-II	III-I	III-II	IV-I	IV-II	
1.	HS	2	2	0	0	1	-	-	-	5
2.	BS	7	7	3	3	-	-	-	-	20
3.	ES	8	8	7	10	3	3	4	-	43
4.	PC	-	-	10	8	17	15	7	6	63
5.	CE	-	-	-	-	-	-	6	6	12
6.	OE	-	-	-	-	0	3	3	-	6
7.	AC	-	-	-	0	-	-	0	-	0
8.	PW	-	-	-	-	-	1	-	10	11
Total		**17**	**17**	**20**	**21**	**21**	**22**	**20**	**22**	**160**

Note: HS- Humanities and Social Science; BS- Basic Sciences; ES – Engineering Science; PC – Professional Core; CE- Core Elective; OE- Open Elective; PW - Project Work; AC – Audit Course.

PERCENTAGE – WISE CREDIT DISTRIBUTION

S.No	Category	Credits Allocated	Percentage –wise Credit Distribution
1	HS- Humanities and Social Sciences	6	3.1 %
2	BS – Basic Sciences	20	12.5 %
3	ES – Engineering Science	29	26.9%
4	PC – Professional Core	76	39.4 %
5	CE- Core Elective	12	7.5 %
6	OE- Open Elective	7	3.8 %
7	PW – Project Work	10	6.9 %
8	AC – Audit Course	0	0.00 %
Total		**160**	**100** %

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE311 SWITCHGEAR AND PROTECTION

Course Educational Objectives:
On successful completion of the course students will be able to,

1 Provide the basic principles and operation of various types of circuit breakers.
2 Study the classification, operation of different types of Electromagnetic Protective Relays.
3 Instruct the ideas on protective schemes, for generator and transformers.
4 Impart knowledge of various protective schemes used for feeders and bus bars.
5 Instruct the ideas on the principle and operation of different types of static relays.

Unit -I: Circuit Breakers (9 hours)

Elementary principles of arc interruption –Restriking voltage & Recovery voltage – Rate of rise of recovery voltage –Numerical problems– Resistance switching– Current chopping - interruption of capacitive current's Specifications and Ratings –Auto reclosures - Types of Circuit Breakers – Air blast– Air break– Minimum oil- SF6 and Vacuum circuit breakers – Comparative merits of different circuit breakers – Testing of circuit breakers.

Unit -II: Relays (9 hours)

Basic Requirements of Relays – Primary and Backup protection – Construction details of attracted armature –Balanced beam –Induction type and differential relays – Universal Torque equation – Characteristics of over current, Direction and distance relays. Static Relays –Types – Comparators – Amplitude and Phase comparators - Microprocessor based relays – Block diagram for over current (Definite, Inverse and IDMT) and Distance Relays and their Flow Charts.

Unit -III: Generator Protection and Transformer Protection (9 hours)

Protection of generators against Stator faults – Rotor faults and Abnormal Conditions - Restricted Earth fault and Inter-turn fault Protection - Numerical Problems on % Winding Unprotected - Protection of transformers –Percentage Differential Protection –Numerical Problem on Design of CT Ratios – Buchholtz relay Protection.

Unit -IV: Protection of Feeder and Transmission Lines (9 hours)

Principles and need for protective schemes –nature and causes of faults- Types of faults -Zones of protection and essential qualities of protection – Protection schemes-Protection of Feeder (Radial & Ring main) using over current Relays - Protection of Transmission line – 3 Zone protections are using Distance Relays. Carrier current protection-Protection of Bus bars.

Unit -V: Protection Against Over Voltages and Earthing (9 hours)

Protection Against Over Voltages -Generation of Over Voltages in Power Systems– Protection against Lightning Over Voltages –Valve type and Zinc– Oxide Lighting Arresters – Insulation

Coordination –BIL. Power system Earthing –Method of Neutral Earthing.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF6 gas type.	PO1
CO2	Understand the working principle and operation of different types of electromagnetic protective relays.	PO1
CO3	Acquire knowledge of faults and protective schemes for high power generator and transformers.	PO1
CO4	Improves the ability to understand various types of protective schemes used for feeders and bus bar protection.	PO1,PO2,PO3,PO4
CO5	Understand different types of static relays and their applications.	PO1

Text Books:

1. Switchgear and Protection, 10/e 2009, Sunil S Rao , Khanna Publishers - New Delhi.
2. Power System Protection and Switchgear , 1/e 2007 , Badri Ram and D.N Viswakarma , Tata McGraw – Hill Education Pvt. Ltd. Noida.

Reference Books:

1. A Text Book on Power System Engineering , 1/e 1998, M.L.Soni, P.V.Gupta, V.S.Bhatnagar and A. Chakrabarti – DhanpatRai and Co – New Delhi.
2. Fundamentals of Power System Protection, 2/e 2010, Y. G. Paithankar and S. R. Bhide , PHI Learning Pvt Ltd – New Delhi.
3. Switch Gear Protection, 1/e 2009, J. B. Gupta , S. K. Kataria and Sons – New Delhi.
4. Power System Protection& Switch Gear, 1/e 1977 (Reprint 2005) , B. Ravindranath, M. Chander , New Age International Pvt .Ltd – New Delhi.
5. Protection & Switch Gear, 4/e 2009 U. A. Bakshi and M. V. Bakshi , Technical Publications – Pune.

CO-PO Mapping:

CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	1	1	3	3	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO*	**2.2**	**1**	**3**	**3**	-							

B.TECH III-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE312 DISTRIBUTION OF ELECTRIC POWER

Course Educational Objectives:
On successful completion of the course students will be able to,

1 Acquire knowledge of Distribution system, types of loads and their characteristics.
2 Impart knowledge on methods of classification of different distribution systems and determine voltage drops in DC distribution systems.
3 Impart knowledge on methods of classification of different distribution systems and determine voltage drops in AC distribution systems.
4 Capitalize knowledge of various types of substations and their optimal locations. To gain knowledge of different bus bars and their operation.
5 Know the importance and improvement of power factor and voltage control in distribution systems.

Unit I: General Concepts (9 hours)

Introduction to distribution systems, Load factor, Diversity factor, Capacity factor, Utilization factor, Coincidence factor, Contribution factor, loss factor – Relationship between the load factor and loss factor. Load curve and load duration curves – Classification of loads (residential, commercial, agricultural and industrial) and their characteristics.

Unit II: DC Distribution Systems (9 hours)

Classification of Distribution systems – Comparison of DC vs AC and Underground vs Overhead distribution systems – Requirements and design features of Distribution systems- Voltage drop Calculations (Numerical Problems) in DC Distributors for the following cases: Radial DC Distributor fed from one end and fed from the both the ends (equal/unequal Voltages) – Ring main distributor. Distributors with concentrated and uniform loading – numerical problems.

Unit III: AC Distribution Systems (9 hours)

Requirements and design features of AC Distribution feeders: Radial and loop types of primary feeders, feeder voltage levels, feeder loading – Basic design practice of the secondary distribution system. Voltage drop calculations (Numerical Problems) in AC Distributors for the following cases: Power factors referred to receiving end voltage and with respect to respective load voltages.

Unit IV: Substations (9 hours)

Classification of substations – Indoor, Outdoor, transformer substations, layout of 33kV/11kV, 11kV/400V substations showing the location of all the equipments, symbols for equipments in the substations, Applications of Isolators, Earthing switches and load break switches, Optimal substation location – Bus bar arrangements: single, double, main and transfer, ring, one and half

bus bar schemes and their operation.

Unit V: Protection and Coordination of Distribution Systems. (9 hours)

Causes and effects of low power factor – Methods of improving PF- Most economical PF for constant kW load – numerical problems. Importance of voltage control, methods of voltage control: shunt, series capacitors, synchronous condensers, tap changing and booster transformers. Objectives of distribution system protection, Protective Devices: Principle of operation of fuses, circuit reclosures, line sectionalizes, and circuit breakers- Coordination of protective devices: General coordination procedure.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		**Pos related to Cos**
CO1	Demonstrate knowledge on distribution system, types of loads and their characteristics.	PO1,PO2
CO2	Acquire knowledge on methods of classification of different distribution systems and determine voltage drops in DC distribution systems.	PO1,PO2,PO3
CO3	Acquire knowledge on methods of classification of different distribution systems and determine voltage drops in AC distribution systems.	PO1,PO2,PO3
CO4	Incurs knowledge of various types of substations and their optimal locations, different bus bars and their operation.	PO1,PO5
CO5	Knows the importance and improvement of power factor and voltage control in distribution systems. Can understand coordination of protective devices.	PO1,PO2,PO3,PO4

Text Books:

1. Distribution of Electric Power – by Dr. H.P. Inamdar, Electrotech Publication, 1st Edition, 2011.
2. Electrical Power Distribution systems – by V.Kamaraju, McGraw Hill Publishers, 2017.

Reference Books:

1. Electrical Power Distribution system Engineering, Turan Gonen, McGraw Hill Publishers, 1986.
2. Electrical Power Distribution, A.S. Pabla, McGraw Hill Publishers, 2004.
3. Principles of Power Systems, 4th Edition, V.K.Mehta, S.Chand Publishers.

CO-PO Mapping:

CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	2	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**2.2**	**2.6**	**2**	**2**							

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE313 CONTROL SYSTEMS

Course Educational Objectives:
On successful completion of the course, students will be able to

1 The concepts of open and closed loop control systems.
2 Analyse the Time and frequency domain response of second order systems.
3 Design a compensator to meet the design specifications of control system.
4 Solve problems pertaining to control systems to provide feasible solutions in real time environment.
5 Apply the conceptual knowledge of control systems in domestic and industrial applications.

Unit I: Mathematical Modeling of Systems: (9 hours)

Introduction to control systems. Basic elements of control system - open loop and closed loop systems. Effect of feedback. Modelling of physical systems-electrical systems, mechanical systems, analogous systems, armature control and field control of DC motor, DC servomotor. Transfer function - block diagram reduction techniques, signal flow graph.

Unit II: Time Response and Stability Analysis: (9 hours)

Various test signals and its importance. Time response of first and second order systems, Time-domain specifications, steady state response, steady state error and error constants, static and generalized error coefficients.Routh-Hurwitz stability criterion, Root locus technique- root locus diagram, rules to construct root loci, effect of pole zero additions on the root loci.

Unit III: Frequency Domain Analysis: (9 hours)

Performance specifications in the frequency domain. Stability analysis - Bode plot, Polar plot and Nyquist plot.

Unit IV: Controllers and Compensators: (9 hours)

Introduction to controllers, effect of P, PI and PID controllers. Compensators - lag, lead, lead-lag compensator design using Bode plot.

Unit V: State Space Analysis: (9 hours)
Transfer function vs state space representation. Concepts of state, state variables and state model.Modeling of physical system in state space. Transfer function to state model and vice versa. State transition matrix and its properties. Controllability and observability using

Kalman's test. **TOTAL: 45 Hours**

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge onThe concepts of open and closed loop control systems.	PO1,PO2,PO3,PO4
CO2	Analyse Time and frequency domain response of second order systems.	PO1,PO2,PO3,PO4
CO3	Design a compensator to meet the design specifications of control system.	PO1,PO2, PO3
CO4	Solve problems pertaining to control systems to provide feasible solutions in real time environment.	PO1,PO2,PO4
CO5	Apply the conceptual knowledge of control systems in domestic and industrial applications.	PO1,PO2,PO12

Text Books:

1. Anandkumar, Control Systems, PHI learning Pvt Ltd., 2ndedition, 2014.
2. Katsuhiko Ogata, Modern Control Engineering, Pearson Education Publishers, 5th edition, 2010.

Reference Books:

1. Nagrath I.J. and Gopal M, Control Systems Engineering, New Age International Publications, 5th edition, 2010.
2. Richard C. Dorf and Robert H. Bishop, Modern Control Systems, Prentice Hall, 12th edition,2010.
3. Benjamin C.Kuo and Farid Golnaraghi, Automatic Control Systems, John Wiley & Sons Publications, 8th edition, 2002.
4. A.Nagoorkani, Control Systems, RBA Publications, 2nd edition,2006.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	**2**	-	-	-	-	-	-	-	-	-
CO4	3	3	-	**2**	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	2
CO*	**3**	**2.8**	**2**	**1.6**								**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE314 ELECTRICAL MACHINES II

Course Educational Objectives:
On successful completion of the course, students will be able to

1. Demonstrate knowledge on construction and working of transformers.
2. Impart knowledge on testing of transformers and auto transformers.
3. Demonstrate knowledge on testing of poly phase transformers
4. Impart knowledge on construction, working of induction machines and analyze the behavior of induction machines for various operating conditions
5. Understand Methods of Starting and Speed Control of Induction Motors

Unit I: Single Phase Transformers (9hours)

Single phase transformers - working principle, constructional details, types, ideal transformer, EMF equation, operation on no-load and on-load, phasor diagrams, losses, equivalent circuit, Effects of variation of frequency and supply voltage on iron losses.

Unit II: Transformer Testing and Auto Transformers (9hours)

OC and SC tests, separation of losses test, efficiency and regulation. Polarity test, Sumpner's test, all day efficiency. Parallel operation with equal and unequal voltage ratios. Auto transformers equivalent circuit, comparison with two winding transformers.

UNIT III: THREE PHASE TRANSFORMERS (9hours)

Poly phase transformers – Poly phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Third harmonics in phase voltages - three winding transformers - tertiary windings - Determination of Z_p, Z_s and Z_t transients in switching - off load and on load tap changing; Scott connection.

Unit IV: Three Phase Induction Motors (9hours)

Poly phase induction motors - Construction details of cage and wound rotor machines - production of a rotating magnetic field - principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current and power factor at standstill and during operation, torque equation- expressions for maximum torque and starting torque – torque slip characteristic. Rotor power input, rotor copper loss and mechanical power developed and their inter relation- double cage and deep bar rotors - equivalent circuit – phasor diagram.

Unit V: Starting and Speed Control Methods (9hours)

Methods of starting and starting current and torque calculations, crawling and cogging .Speed control-voltage control, frequency control and pole changing and methods of consequent poles;

cascade connection. Injection of an EMF into rotor circuit (qualitative treatment only). Induction generator – principle of operation.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on construction and working of transformers.	PO1,PO2
CO2	Acquire knowledge on testing of transformers and auto transformers	PO1,PO2,PO3
CO3	Demonstrate knowledge on testing of poly phase transformers	PO1,PO2,PO3
CO4	Analyze the behavior of induction machines for various operating conditions.	PO2
CO5	Demonstrate knowledge on Methods of Starting and Speed Control and design suitable accessories/techniques for the starting and speed control of induction motors.	PO1, PO2, PO3, PO12

Text Books:

1. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
2. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.

Reference Books:

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
3. Electrical Machines by M G SAY
4. Electrical Machines and transformers by KOSAO

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	1	-	-	-	-	-	-	-	-	2
CO*	3	3	1.6									2

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18ECE318 **IC APPLICATIONS**

Course Educational Objectives:
On successful completion of the course, students will be able to

1. Introduce the basic building blocks of linear integrated circuits
2. Teach the linear and non - linear applications of operational amplifiers.
3. Teach the theory of ADC and DAC
4. Introduce the theory and applications of analog multipliers and PLL
5. Introduce the concepts of waveform generation and introduce some special function ICs

Unit I: IC Fabrication **(9hours)**

IC Classification, chip size and circuit complexity, fundamentals of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realiztion of monolithic ICs and packaging.

Unit II: Characteristics of Op-Amp **(9hours)**

Ideal & practical Op-amp Characteristics, DC and AC characteristics-Offset voltage and current :voltage series feedback and shunt feedback amplifiers, differential amplifier, frequency response of op -amp -Basic Application of op-amp –Summer, differentiator and integrator.

Unit III: Applications of Op-Amp **(9hours)**

Instrumentation amplifier-first and second order active filter, Current to Current and Current to Voltage converters-Multipliers and dividers –Comparators-Multivibrators, Wave generators-Clippers, Clampers, Peak detectors, S/H Circuit, D/A converter- R-2R ladder & weighted resistor types, A/D converter- dual slope, successive approximation and flash type.

Unit IV: Special ICS **(9hours)**

Introduction to 555 timer- functional diagram- Monostable and Astable operations and Schmitt Trigger.566 voltage control oscillator circuit,565 PLL –Introduction, block diagram, principles and description of individual blocks of 565 functioning and application, analog multiplier ICS.

Unit V: Application ICs **(9hours)**

IC regulators –LM317, LM 723 regulator, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, Isolation amplifiers, optocoupler, optoelectronic ICs.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand introduce the basic building blocks of linear integrated circuits.	PO1,PO2
CO2	Remember the linear and non - linear applications of operational amplifiers.	PO1,PO2
CO3	Remember the theory of ADC and DAC.	PO1,PO2
CO4	Remember the theory of analog multipliers and PLL and analyze its applications.	PO1,PO2
CO5	Understand the concepts of waveform generation and introduce some special function ICs	PO1

Text Books:

1. Op-Amps & Linear ICs, 4th Edition, 1987,Ramakanth A. Gayakwad,PHI,New Delhi.
2. Linear Integrated Circuits, 2nd Edition,2003,D. Roy Chowdhury,New Age International (p)Ltd,Mumbai.

References:

1. Design with Operational Amplifiers & Analog Integrated Circuits, 3rd Edition.-2002,Sergio Franco, McGraw Hill, New Delhi.
2. Linear IC and Applications, 1st Edition,2005,U.A.Bakshi and A.P.Godse,Technical Publications,Pune.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.25**										

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE315 POWER SYSTEM ANALYSIS

Course Educational Objectives:
On successful completion of the course, students will be able to

1	Demonstrate knowledge on Per unit representation, symmetrical component theory and sequence network representation of power system networks.
2	Analyse the power system networks for the formation of bus impedance and admittance matrices.
3	Evaluate the power system network for various planning strategies and provide a feasible solution.
4	Apply appropriate techniques/methods to analyse power system network operating under various conditions.
5	Apply the conceptual knowledge of power system analysis to assess and analyse a power system for various scenarios.

Unit I: Per Unit Systems and Symmetrical Component Theory (9 hours)

Per unit system representation, advantages, per unit equivalent reactance representation of power system components. Symmetrical component theory - voltages, currents and impedances. Sequence representation of power system components- Generators, transformers, transmission line, load and networks.

Unit II: Power System Network Matrices (9 hours)

Bus admittance matrix - Direct inspection method. Bus impedance matrix- Formation of Z bus matrix for partial network, algorithm for the modification of bus impedance matrix – addition of element from a new bus to reference, new bus to an old bus, between an old bus & reference and between two old buses.

Unit III: Power Flow Studies (9 hours)

Introduction, derivation of static load flow equations. Load flow solution using Gauss-Seidel method, Newton-Raphson method- with and without PV bus, Decoupled and Fast decoupled methods (maximum of 3-buses for one iteration only). Algorithm and flowcharts, Comparison of different load flow methods.

Unit IV: Fault Analysis (9 hours)

Introduction, Unsymmetrical faults - LG, LL, and LLG - with and without fault impedance. Symmetrical fault - LLL & LLLG faults. Symmetrical fault analysis using Z bus, short circuit current and MVA calculations.

Unit V: Power System Stability **(9 hours)**

Elementary concepts of stability. Steady state stability – power limit, transfer reactance, power

angle curve, derivation of swing equation. Transient stability - equal area criterion, applications- critical clearing angle, critical clearing time. Methods to improve stability - auto re-closure and fast operating circuit breakers.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on Per unit representation, symmetrical component theory and sequence network representation of power system networks.	PO1,PO2,PO3,PO4
CO2	Analyse The power system network for sequence network representation.	PO1,PO2,PO3,PO4
CO3	Evaluate Per unit quantities for various power system components and networks.	PO1,PO2
CO4	Apply appropriate techniques/methods to analyse power system network operating under various conditions.	PO1,PO2
CO5	Apply the conceptual knowledge of power system analysis to assess and analyse a power system for various scenarios.	PO1,PO2

Text Books:

1. C. L. Wadhwa, Electrical Power Systems, New Age International(P) Limited publishers, New Delhi, 6th edition, 2010
2. P. Venkatesh, B.V. Manikandan, S. Charles Raja and A. Srinivasan, Electrical power systems analysis, Security and deregulation, PHI learning private limited, Delhi, 2014.

Reference Books:

1. G. W. Stagg and A.H. El-Abiad, Computer Methods in PowerSystem Analysis, Mc Graw-Hill, New Delhi, International studentedition, 1968.
2. John J. Grainger and William D. Stevenson, JR, Power SystemAnalysis, Mc Graw-Hill Education (India) Pvt. Limited, 1994.
3. HadiSaadat, Power System Analysis, Tata Mc Graw-Hill Publishing Company Limited, New Delhi, 2nd edition, 2002.

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	3	**2**	**2**	**2**								

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-I SEM (EEE)

L	T	P	C
0	0	2	1

SUB CODE: 18EEE316 **ELECTRICAL MACHINES LAB-II**

Course Educational Objectives:

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

1 Provide practical experience for the determination of efficiency of transformers.

2 Evaluate the regulation of alternators by conducting suitable tests.

3 Analyze the performance characteristics of induction motors

4 Obtain the equivalent circuit parameters of transformers and induction motors.

5 Determine various losses of AC machines by conducting suitable tests.

Any Six of Following Experiments:

1. Open circuit and short circuit tests on single phase transformer
2. Sumpner's test on transformers
3. Regulation of three phase alternator by EMF and MMF methods
4. Determination of Sub-Transient Reactance of Salient Pole Synchronous Machine
5. V and inverted v curves of three phase synchronous motor.
6. No load and blocked rotor test on single-phase induction motor.
7. Brake test on three-phase induction motor.
8. No load and blocked rotor test on three-phase induction motor.

Any Four of the following experiments are required to be conducted in addition to above

1. Scott Connection of transformer
2. Separation of no-load losses in single phase transformer
3. Separation of no-load losses of three-phase induction motor.
4. Parallel operation of single-phase transformer
5. Regulation of three phase alternator by ZPF and ASA methods
6. Load test on single-phase transformer and three phase transformer connections
7. Brake Test on Single- Phase Induction Motor
8. Efficiency of Three-Phase Alternator

Text Books:

1. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
2. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on various parts of AC machine.	PO1
CO2	Analyze the performance of various AC machines.	PO2
CO3	Determine various losses of AC machines by conducting suitable test	PO4
CO4	Select appropriate design tools and procedure to evaluate performance of AC machines	PO5
CO5	Follow ethical principles to evaluate performance of AC machines.	PO8
CO6	Do experiments effectively as an individual and as a member in a Group.	PO9
CO7	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO8	Continue updating their skill related to electronic devices and their applications during their life time	PO12

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**		**3**	**3**			**3**	**3**	**3**		**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-I SEM (EEE)

L	T	P	C
0	0	2	1

SUB CODE: 18EEE317 CONTROL SYSTEMS AND SIMULATION LAB

Course Educational Objectives:
On successful completion of the course, students will be able to

1 To demonstrate knowledge on different types of controllers.
2 To determine the characteristics of DC and AC servomotors.
3 To apply skills in DC position control and temperature control systems.
4 To obtain the transfer function of DC motors by conducting suitable tests.
5 To evaluate stability of Control system by different methods using MATLAB.

Any Six of Following Experiments:

1. Time Response of Second Order System.
2. Characteristics of Synchros.
3. Transfer Function of Armature Controlled DC Machine.
4. Transfer Function of Separately Excited DC Generator.
5. Effect of P - PD - PI - PID Controller on A Second Order Systems
6. Lag and Lead Compensation – Magnitude and Phase Plot
7. Characteristics of Magnetic Amplifiers
8. Effect of feedback on DC Servo Motor
9. Characteristics of AC Servo Motor

Any Four of The Following Experiments

1. Programmable logic controller- study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
2. Temperature control using PID controller.
3. PSPICE Simulation of OP-Amp based Integrator and Differentiator circuits
4. Linear System Analysis (Time Domain Analysis - Error Analysis) Using MATLAB.
5. Stability Analysis of Control System - Bode Plot, Root Locus and Nyquist Plot Using MATLAB
6. State Space Model for Classical Transfer Function Using MATLAB
7. Analysis of a physical system using MATLAB.
   - •Transfer function to state space and vice versa
   - •Controllability and observability
   - •Implementation using SIMULINK
8. Balance control of rotary inverter pendulum using LABVIEW.

Text Books:

1. Anandkumar, Control Systems, PHI learning Pvt Ltd., 2ndedition, 2014.
2. Katsuhiko Ogata, Modern Control Engineering, Pearson Education Publishers, 5th edition, 2010.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OUTCOMES:

On successful completion of course, student will be able to		POs related to COs
CO1	Demonstrate knowledge on different types of controllers.	PO1
CO2	Analyze the characteristics of DC and AC servomotors	PO2
CO3	Determine the transfer function of DC motors by conducting suitable tests.	PO4
CO4	Select appropriate design tools and procedure to evaluate stability of Control system	PO5
CO5	Follow ethical principles to evaluate performance of AC machines.	PO8
CO6	Do experiments effectively as an individual and as a member in a group.	PO9
CO7	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO8	Continue updating their skill related to electronic devices and their applications during their life time	PO12
CO9	Analyze rotary inverter pendulum using LABVIEW.	PO3

CO-POMAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	**3**
CO9	-	-	**3**	-	-	-	-	-	-	-	-	
CO*	**3**	**3**	**3**	**3**	**3**			**3**	**3**	**3**		**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18SAH311 COMMUNICATION AND SOFT SKILLS LAB

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Expose the students to variety of self instructional, learner friendly modes of language learning.
2 Help the students cultivate the habit of reading passages from the computer monitor.
3 Enable them to learn better pronunciation through Stress, Intonation and Rhythm
4 Train them to use language effectively to face interviews, group discussions, public speaking.
5 Initiate them into greater use of the computer in resume preparation, report writing.,

List of Exercises:

1. Pronunciation of English words using Phonetic sounds and Symbols.
2. Describing –Objects-People-Situations
3. Stress and Intonation
4. Oral Presentations
5. Functional English
6. Reading Comprehension
7. Vocabulary Building
8. Group Discussion
9. Resume writing and Report writing
10. Interview Skills

Course Outcomes:

On successful completion of the course, Students will be able to		**POs related to COs**
CO1	To remember and understand the different aspects of the English Language proficiency with emphasis on LSRW skills.	PO1
CO2	To analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking by group discussion.	PO2
CO5	Use of modern computing facilities and suitable software tools to improve the communication skills and elocution.	PO5
CO6	Follow the ethical principles to prepare the group tasks	PO8
CO7	Perform exercise individually and also a team to complete the task	PO9
CO8	To apply communication skills through various language learning activities.	P10
CO9	To create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.	P12

TEXT BOOKS:
1. Lab manual provided by the department.

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-		3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	-	-	**3**	-	-	**3**	**3**	**3**	-	**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-II SEM(EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18MBA321 PRINCIPLES OF MANAGEMENT

COURSE EDUCATIONAL OBJECTIVES:

On successful completion of the course, students will be able

1 To create understanding of the concepts and techniques of management
2 To enrich the knowledge on the roles and responsibilities in managerial position
3 To enhance the planning and decision making skills
4 To inculcate knowledge on organizing and controlling in the context of business
5 To provide a framework of financial planning and reporting

UNIT-1: INTRODUCTION TO MANAGEMENT (9hours)

Definition of management –science or art-Types of managers –managerial roles –levels of management –Functions of management-Principles of management and scientific management – social responsibilities.

UNIT-2: PLANNING AND DECISION MAKING (9hours)

Nature and purpose of planning- Planning process- Types of planning-Objectives- Setting objectives - Policies-Planning premises- Planning Tools and techniques. Decision-making – Importance of Decision making - Decision making steps.

UNIT-3: ORGANISING AND DIRECTING (9hours)

Nature and purpose-Formal and informal organization – Organization structure - Line and staff authority – Departmentalization – Staffing and its process. Directing – Meaning – Importance – Principles of directing.

UNIT-4: CONTROLLING AND CO-ORDINATING (9hours)

Process of controlling- Techniques of controlling - Control and Performance - Direct and preventive control - Co-ordination

UNIT-5: BUDGETING AND REPORTING (9hours)

Budgeting – Types of Budgeting – Budgetary and Non Budgetary Techniques - Reporting – Best practices of reporting.

Course Outcomes:

On successful completion of the course the student will be able to,		POs related to Cos
CO1	Understand the concepts of management, roles to be adopted by manager, functions of manager and inculcating the social Responsibility towards different stake holders.	PO6,PO9,PO10, PO12
CO2	To obtain knowledge with regard to planning, planning process and the process of making effective decisions.	PO6,PO8,PO9,PO10, PO11
CO3	To Gain Knowledge about organizational environment and process of staffing and the application of directive principles.	PO6,PO9,PO10,PO12
CO4	To know about controlling and the techniques of controlling	PO6,PO9,PO10,POI1,PO12
CO5	To know about allocation of budget and its techniques and the principles of good reporting.	PO6,PO8,PO9,PO10,PO12

Text Books:

1. Principles of Management, M. Govindarajan and S. Natarajan, Prentice Hall of India Pvt. Ltd.
2. Management, Stephen P. Robbins and Mary Coulter, 8/e, Prentice Hall of India.

Reference Books:.

1. Principles of Management, Charles W.L Hill, Steven L Mc Shane, 2007Megraw Hill Education, Special Indian Edition.
2. Management-A Competency Based Approach, Hellriegel, Slocum and Jackson, 10/e, 2007, Thomson South Western.
3. Management - A global and Entrepreneurial Perspective, Harold Koontz, Heinz Weihrich and mark V Cannice, 12/e, 2007, Tata Mcgraw Hill.
4. Essentials of Management, Andrew J. Dubrin, 7/e, 2007, Thomson South western.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	-	-	2	2	-	2
CO2	-	-	-	-	-	3	-	3	2	2	2	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-	-	2	2	-	2
CO5	-	-	-	-	-	3	-	3	2	2	-	2
CO*	**-**	**-**	**-**	**-**	**-**	**3**		**3**	**2**	**2**	**2**	**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-II SEM(EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE321 **SYSTEM THEORY**

COURSE EDUCATIONAL OBJECTIVES:

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

1	Understand the fundamentals of physical systems in terms of its linear and nonlinear models.
2	Educate on representing systems in state variable form
3	Educate on solving linear and non-linear state equations
4	Exploit the properties of linear systems such as controllability and observability
5	Educate on stability analysis of systems using Lyapunov's theory

Unit - I: State Variable Representation: (**9 hours**)

Introduction-Concept of State-State equations for Dynamic Systems -Time invariance and linearity- Non uniqueness of state model- Physical Systems and State Assignment – free and forced responses- State Diagrams.

Unit II: Solution of State Equations: **(9 hours)**

Existence and uniqueness of solutions to Continuous-time state equations – Solution of Nonlinear and Linear Time Varying State equations – State transition matrix and its properties – Evaluation of matrix exponential- System modes- Role of Eigen values and Eigen vectors.

Unit III: Stability Analysis of Linear Systems: **(9 hours)**

Controllability and Observability definitions and Kalman rank conditions -Stabilizability and Detectability-Test for Continuous time Systems- Time varying and Time invariant case-Output Controllability-Reducibility- System Realizations.

Unit IV: State Feedback Control and State Estimator: **(9 hours)**

Introduction-Controllable and Observable Companion Forms-SISO and MIMO Systems- The Effect of State Feedback on Controllability and Observability-Pole Placement by State Feedback for both SISO and MIMO Systems-Full Order and Reduced Order Observers.

Unit V: Lyapunov Stability Analysis: **(9 hours)**

Introduction-Equilibrium Points- BIBO Stability-Stability of LTI Systems- Stability in the sense of Lyapunov – Equilibrium Stability of Nonlinear Continuous-Time Autonomous Systems-The Direct Method of Lyapunov and the Linear Continuous-Time Autonomous Systems-Finding Lyapunov Functions for Nonlinear Continuous-Time Autonomous Systems – Krasovskil's and Variable-Gradiant Method. **TOTAL: 45 Hours**

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Represent the time-invariant systems in state space form as well as analyze the system is stabilizable.	PO1,PO2,PO3,PO4
CO2	Design state feedback controller and state observers	PO1,PO2,PO3,PO4
CO3	Classify the linear and non-linear state equations	PO1,PO2
CO4	Analyze the stability of certain class of non-linear system.	PO1,PO2
CO5	Describe non-linear behaviors such as Limit cycles, input multiplicity and output multiplicity, Bifurcation and Chaos.	PO1,PO2,PO3

TEXT BOOKS:

1. M. Gopal, "Modern Control System Theory", New Age International, 2005.
2. K. Ogatta, "Modern Control Engineering", PHI, 2002.
3. John S. Bay, "Fundamentals of Linear State Space Systems", McGraw-Hill, 1999.

REFERENCE BOOKS:

1. D. Roy Choudhury, "Modern Control Systems", New Age International, 2005.
2. John J. D'Azzo, C. H. Houpis and S. N. Sheldon, "Linear Control System Analysis and Design with MATLAB", Taylor Francis, 2003.
3. Z. Bubnicki, "Modern Control Theory", Springer, 2005.
4. C.T. Chen, "Linear Systems Theory and Design'' Oxford University Press, 3rd Edition,1999.
5. M. Vidyasagar, "Nonlinear Systems Analysis', 2nd edition, Prentice Hall, Englewood
Cliffs, New Jersey.

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	**2**	-	-	-	-	-	-	-	-	-
CO*	3	**2**	**2**	**2**								

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-II SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE322 **POWER ELECTRONICS**

Course Educational Objectives:

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

1 Impart knowledge on Different types of power semiconductor devices and their switching.
2 Impart knowledge on Operation, characteristics and performance parameters of controlled rectifiers.
3 Impart knowledge on Operation, switching techniques and basics topologies of DC-DC switching regulators.
4 Impart knowledge on Different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
5 Impart knowledge on Operation of AC voltage controller and various configurations.

Unit I: Power Semi-Conductor Devices and Commutation Circuits (9 hours)

Thyristors – Silicon Controlled Rectifier (SCR) – BJT – Power MOSFET – Power IGBT-DIAC-TRIAC and their characteristics – Basic theory of operation of SCR – Static characteristics – Dynamic characteristics of SCR - Turn on and Turn off times - Two transistor analogy –Series and parallel connections of SCR's – Snubber circuit details –SCR turn on methods – R and RC Triggering - UJT firing circuit - Ratings of SCR's.

Unit II: Phase Controlled Rectifiers (9 hours)

Phase control technique – Single phase Line commutated converters – Midpoint, Bridge, and Semi controlled converters with R and RL loads–Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Freewheeling Diode-Effect of source inductance. Three phase converters – Three pulse and six pulse converters – Full bridge connections -Average load voltage With R and RL loads – Effect of Source inductance–Dual converters (both single phase and three phase) – Waveforms.

Unit III: Choppers (9hours)

Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R - RL and motor loads- Step up Chopper – Step up down Chopper –Chopper configurations-Chopper commutation-Morgan's chopper and Jones chopper (Principle of operation only). AC chopper.

Unit IV: Inverters (9hours)

Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter-Bridge inverter – Waveforms –Mc Murray and Mc Murray Bedford inverters - Voltage control techniques for inverters-Pulse width modulation techniques. Three phase bridge VSI -180^0 and 120^0 mode of operation. Current source inverter. UPS basic configurations.

Unit V: AC Voltage Controllers and Cyclo Converters (9hours)

AC voltage controllers – Single phase two SCR's in anti parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage- current and power factor wave forms –Firing circuits Cyclo converters – Single phase mid-point cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only) – Waveforms.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand the concepts on power semiconductor devices.	PO1,PO3,PO4
CO2	Analyze phase controlled converters and corresponding drives.	PO1,PO2,PO3,PO4
CO3	Analyze DC-DC converters and corresponding drives.	PO1,PO2,PO3,PO4
CO4	Analyze inverters and corresponding drives.	PO1,PO2,PO3,PO4,PO5
CO5	Choose the converters for real time applications.	PO1,PO2,PO3,PO4

Text Books:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.
3. Ashfaq Ahmed 'Power Electronics for Technology', Pearson Education, Indian reprint, 2003.

Reference Books:

1. Joseph Vithayathil, 'Power Electronics, Principles and Applications', McGraw Hill Series, 6th Reprint, 2013.
2. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.
3. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.
5. S.Rama Reddy, 'Fundamentals of Power Electronics', Narosa Publications, 2014.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	1	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-
CO5	3	3	1	1	-	-	-	-	-	-	-	-
CO*	**3**	**2.5**	**1.8**	**1.2**	**1**							

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-II SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE323 **ELECTRICAL MACHINES-III**

Course Educational Objectives:
On successful completion of the course, students will be able to

1	Demonstrate knowledge on construction and performance of synchronous generators.
2	Impart knowledge on methods of determining regulation of synchronous generators.
3	Demonstrate knowledge on parallel operation of synchronous generators and analyze effect of change of excitation and mechanical power input.
4	Impart knowledge on operation on synchronous motor, mathematical analysis for power developed and methods of starting of synchronous motor.
5	Impart knowledge on Construction, principle of operation and performance of single phase induction motors and Special machines.

Unit I: Synchronous Generators **(9hours)**

Constructional details of Synchronous machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated EMF – suppression of harmonics – armature reaction and its effect for various operating power factors. Open circuit, short circuit and ZPF characteristics of synchronous machine - phasor diagrams..

Unit II: Regulation Of Synchronous Generator **(9hours)**

Voltage regulation - Synchronous impedance method, Ampere Turns method, ZPF method and new ASA method. Salient pole alternators - two-reaction theory-– experimental determination of Xd and Xq (Slip test), phasor diagrams, voltage regulation. Power flow equations in synchronous generator.

Unit III: Parallel Operation Of Synchronous Generator **(9hours)**

Conditions for parallel operation, methods of synchronization. Synchronizing current, power and torque. Effect of change of excitation and mechanical power input on parallel operation of two alternators, load sharing between two alternators, Synchronous machines on infinite bus bars. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactance.

Unit IV: Synchronous Motors **(9hours)**

Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed. Excitation and power circles – hunting and its suppression – Methods of starting – synchronous induction motor-Power angle diagram.

Unit V: Single Phase Induction Motors & Special Machines (9hours)

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 .

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on construction and performance of synchronous generators.	PO1,PO2,PO3
CO2	Acquire knowledge on methods of determining regulation of synchronous generators.	PO1,PO2,PO3,PO4
CO3	Demonstrate knowledge on parallel operation of synchronous generators and analyze effect of change of excitation and mechanical power input	PO1,PO2
CO4	Acquire knowledge on operation of synchronous motor, methods of starting of synchronous motor and mathematical analysis for power developed.	PO1,PO2
CO5	Demonstrate knowledge on Construction, principle of operation and performance of single phase induction motors and Special machines.	PO1,PO2,PO12

Text Books:

1. Electrical Machines – by P.S. Bimbra, Khanna Publishers.
2. D.P. Kothari and I.J.Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 200
3. Principles of Electrical Machines, V. K. Mehta, Rohit Mehta, S. Chand Publishing.

Reference Books:

1. Electromachanics - III (Synchronous and single phase machines), S. Kamakashiah, Right Publishers..
2. Performance and Design of AC Machines, MG. Say, BPB Publishers.
3. Theory of Alternating Current Machinery, Langsdorf, Tata McGraw-Hill Companies.
4. Electric machinery, A.E. Fitzerald, C. Kingsley and S. Umans, Mc Graw Hill Companies.
5. Electric Machines, Mulukutla S. Sarma, Mukesh K. Pathak, Cengage Learning.
6. Fundamentals of Electric Machines, B. R. Gupta, Vandana Singhal, New Age International Publishers.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	2
CO*	**3**	**2.8**	**2**	**2**								**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-II SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE324 ELECTRICAL AND ELECTRONICS MEASUREMENTS

Course Educational Objectives:

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

1 Demonstrate knowledge on measuring instruments; analyze errors and its compensation.
2 Demonstrate knowledge on power and energy measuring instruments; analyze errors and its compensation.
3 Impart knowledge on instrument transformers, PF meters and analyze errors and its compensation.
4 Impart knowledge on potentiometers, DC and AC bridges
5 Demonstrate knowledge on CRO and transducers.

Unit I: Introduction (9 hours)

Classification- Deflecting - Control and damping torques-Ammeters and voltmeters-PMMC - Dynamometer - Moving Iron type instruments- Expression for deflecting and controlling torques- Errors and compensations -Extension of range using shunt and series resistances.

Unit II: Measurement of Power and Energy (9 hours)

Principle of Operation of EDM type Wattmeters - Errors and compensations - LPF and UPF types - Measurement of Three phase power by two and three wattmeters - Single phase induction type Energy meter-Principle of operation - Errors and compensations in energy meters - Three phase Energy meter.

UNIT III: Instrument Transformers and PF Meters (9 hours)

CT & PT-Phasor diagrams - Errors occurring in instrument transformers and compensations - Different types of PF meters-MI and Electro Dynamometer types - 1-phase and 3-phase meters - Frequency meters.

Unit IV: Potentiometers –DC and AC Bridges (9hours)

D.C potentiometers –Principle and operation - Standardization- DC Crompton's Potentiometers- Applications. A.C potentiometers- Polar and coordinate type - Standardization.- Method of measuring low - Medium and high resistance- Sensitivity of Whetstone's bridge – Kelvin's double bridge for measuring low resistance - Measurement of high resistance - Loss of charge method - Measurement of inductance - Maxwell's bridge - Anderson's bridge - Measurement of capacitance and loss angle - Desauty bridge - Wien's bridge - Schering Bridge.

Unit V: CRO- Digital Meters - Transducers and Data Acquisition Systems (9 hours)

Cathode Ray Oscilloscope- Cathode Ray tube-Time base generator –Deflection system -Horizontal and Vertical amplifiers - Application of CRO – Lissajous Patterns - Classification of transducers- Measurement of pressure using electrical transducers-Measurement of torque using transducers- Piezoelectric - Optical and digital transducers. **TOTAL: 45 Hours**

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Demonstrate knowledge on measuring instruments; analyze errors and its compensation.	PO1,PO2
CO2	Demonstrate knowledge on power and energy measuring instruments; analyze errors and its compensation.	PO1,PO2
CO3	Demonstrate knowledge on instrument transformers and PF meters and analyze errors and its compensation.	PO1,PO2
CO4	Demonstrate knowledge on potentiometers, DC and AC bridges	PO1
CO5	Demonstrate knowledge on CRO and transducers	PO1

Text Books:

1. Electrical Measurements: Fundamentals Electrical& Electronic Measurement &Instruments – 18/e –2010 A.K.SawhneyDhanpatRai& Co. Publications – New Delhi.
2. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications.

Reference Books:

1. Electrical Measurements - Concepts - Applications– 1/e 2006 - Reissland - M.U - New Age International (P) Limited - Publishers – New Delhi.
2. Electrical Measurements – by Buckingham and Price, Prentice – Hall.

CO-PO Mapping:

CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
O*	**3**	**2**										

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
B.TECH III-II SEM (OE)					
	MATHEMATICAL MODELLING - ANALYSIS AND APPLICATIONS	**3**	**1**	**0**	**3**
SUB CODE:18OSAH321	**OPEN ELECTIVE -I**				

Course Educational Objectives:

1: To learn the need and techniques of mathematical modeling, to design mathematical models through trigonometry and calculus.
2: To understand, familiarize the knowledge of the significance of ordinary differential equations of second order based mathematical models through linear.
3: To explore the practical utility of mathematical models through linear programming including transportation and assignment models.
4: To learn the concepts of linear difference equations with constant coefficients and understand some simple models through difference equations
5: To learn the concepts of Partial differential equations and its nature. To explore the knowledge on practical utility of mathematical models through mass balance equations and momentum balance equations.

UNIT-I Introduction (9hours)

The Technique of Mathematical Modeling - Classification of Mathematical Models - Some Characteristics of Mathematical Models - Mathematical Modeling Through Trigonometry, Calculus - Limitations of Mathematical Modeling

UNIT-II Mathematical Modeling through Ordinary Differential Equations of Second Order (9hours)

Mathematical Modeling of Planetary Motions, Circular Motion and Motion of Satellites – Mathematical Modeling through linear differential equations of second order

UNIT-III Mathematical Modeling through Linear Programming (9hours)

Mathematical Modeling through Linear Programming - Graphical Method - Simplex Method - Transportation and Assignment Models

UNIT-IV Mathematical Modeling through Difference Equations (9hours)

The Need for Mathematical Modeling Through Difference Equations: Some Simple Models - Basic Theory of Linear Difference Equations with Constant Coefficients - Solution by Z-transformation - Mathematical Modeling Through Difference Equations in Probability Theory

UNIT-V Mathematical Modeling through Partial Differential Equations (9hours)

Mass-Balance Equations: The First Method of Getting PDE Models - Momentum-Balance Equations: The Second Method of Obtaining PDE Models - Nature of Partial Differential Equations

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes:

After the completion of this course, a successful student is able to

	Course Outcomes	POs related to COs
CO1	Acquire knowledge in necessity and techniques of mathematical modelling, to develop analytical and designing skills in mathematical models through trigonometry and calculus.	PO1,PO2,PO3 PO4
CO2	Demonstrate knowledge in Ordinary differential equations of second order, mathematical modeling through differential equations, and Develop analytical skills in modeling geometrical problems through Ordinary differential equations of second order	PO1,PO2,PO3 PO4
CO3	Demonstrate knowledge in Linear programming and various techniques including Graphical method and Simplex method. Develop analytical and designing skills in modeling and solving Transportation and assignment models	PO1,PO2,PO3 PO4
CO4	Acquire knowledge in difference equations, theory of difference equations with constant coefficients. Develop designing and analytical skills in modeling and solving mathematical models difference equations in probability theory.	PO1,PO2,PO3 PO4
CO5	Acquire knowledge in partial differential equations and develop designing and analytical skills in modeling and solving mathematical models through Mass-Balance equations and Momentum-Balance equations	PO1,PO2,PO3 PO4

Text Books:

1. Mathematical Modelling, J.N. Kapur, New Age International (P) Limited Publishers, New Delhi
2. Advanced Engineering Mathematics, Kreysig, , John Wiley, NewYork, 1999.

Reference Books:

1. Principles of Mathematical Modeling (2004)-Clive L. Dyne, Elsevier Publication
2. Mathematical Modeling – A case study approach , R Illner, C Sean Bohun, S McCollum, T van Roode, AMS publication, 2005
3. Mathematical Modeling , D N P Murthy, N W Page, E Y Rodin, Pergamon Press,1990
4. OR Theory & Applications, J.K. Sharma , Mac Milian India Ltd., 1998
5. Mathematical Modeling(A Comprehensive Introduction), Gerhard Dangelmayr and Michael Kirby, Prentice Hall, New Jersey

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**3**	**2**	-	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
B.TECH III-II SEM (OE)					
	BUSINESS COMMUNICATION AND CAREER SKILLS	**3**	**0**	**0**	**3**
SUB CODE: 18OSAH322	**(OPEN ELECTIVE-I)**				

Course Educational Objectives:

1: To enhance the communication skills

2: To enable students to understand the nuances of corporate communication

3: To develop the writing skills for business purposes

4: To develop the presentation skills for corporate situations

5: To enable students to manage interviews successfully

Unit- I Nature and Scope of Communication **(9hours)**

Introduction: Functions of Communication – Roles of a Manager – Communication Basics – Communication Networks – Informal Communication – Interpersonal Communication – Communication Barriers.

Unit – II Corporate Communication **(9hours)**

Introduction: What is Corporate Communication? – Corporate Citizenship and Social Responsibility – Corporate Communication Strategy – Crisis Management/Communication – Cross-Cultural Communication

Unit – III Writing Business Documents **(9hours)**

Introduction: Importance of Written Business Communication, Types of Business Messages – Five Main Stages of Writing Business Messages – Business Letter Writing - Email writing skills – Effective Business Correspondence – Common Components of Business Letters – Strategies for Writing the Body of a Letter- Business Communication and different cultures.

Unit – IV Careers and Resumes **(9hours)**

Introduction – Career Building – Business Presentations and Speeches – Resume Formats – Traditional, Electronic and Video Resumes – Sending Resumes – Follow-up Letters – Online Recruitment Process.

Unit – V Interviews **(9hours)**

Introduction – Fundamental Principles of Interviewing – General Preparation for an Interview – Success in an Interview – Types of Interviewing Questions – Important Non-verbal Aspects – Types of Interviews – Styles of Interviewing

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes:

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

Course Outcomes		POs related to COs
CO1	Explain the concept of communication, its methods and types	PO10, PO12
CO2	Demonstrate knowledge of Corporate Communication	PO10, PO11
CO3	Apply written and oral communication techniques in preparing and presenting various documents in technical writing	PO10,PO11, PO12
CO4	Exhibit the presentation skills in business situations	PO10,PO12
CO5	Apply verbal and Non verbal aspects in the most appropriate way in interviews.	PO10, PO12

TEXT BOOK:

1. Meenakshi Raman and Prakash, Singh Business Communication, Oxford University Press, New Delhi, Second Edition, 2012.

REFERENCE BOOKS:

1. Neera Jain and Sharma Mukherji, Effective Business Communication, Tata Mc Graw-Hill Education, Pvt. Ltd., New Delhi, 2012.

2. Courtland L.Bovee et al., Business Communication Today, Pearson, New Delhi, 2011.

3. Krizan, Effective Business Communication, Cengage Learning, New Delhi, 2010.

4. R.K. Madhukar, Business Communication, Vikas Publishing House Pvt. Ltd., New Delhi, 2005.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	3	-	2
CO2	3	-	-	-	-	-	-	-	-	3	2	-
CO3	3	-	-	-	-	-	-	-	-	3	2	2
CO4	3	-	-	-	-	-	-	-	-	3	-	2
CO5	3	-	-	-	-	-	-	-	-	3	-	2
CO*	**3**	-	-	-	-					**3**	**2**	**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
B.TECH III-II SEM (OE)					
	LASERS AND FIBER OPTICS	**3**	**1**	**0**	**3**
SUB CODE:18OSAH323	**OPEN ELECTIVE -I**				

Course Educational Objectives:

1: To acquire knowledge on fundamentals of LASERS

2: To study the working of different types of LASERS

3: To develop knowledge on applications of LASERS in various fields

4: To gain knowledge in fundamentals of Optical fiber, construction, types and attenuations

5: To develop knowledge on applications of Optical fibers in various fields

Unit- I LASER Introduction: **(9hours)**

Introduction- Spontaneous and stimulated emission of radiation- Properties of lasers (monochromacity, directionality, coherence and brightness) - Conditions for laser action : population inversion- Pumping and different pumping mechanisms- Einstein coefficients and relation among the coefficients.

Unit – II Types of Lasers: **(9hours)**

Nd-YAG laser- He: Ne laser- Semiconductor laser (GaAs) - Argon Ion Laser-CO_2 Laser.

Unit – III Applications of Lasers: **(9hours)**

Lasers in Holography- Laser in fusion reaction- Lasers in Raman spectroscopy- Lasers in industry -Lasers in isotope separation- Lasers in medicine.

Unit – IV Optical Fibers: **(9hours)**

Introduction- Construction of fiber – Working principle of optical fiber (total internal reflection)- Propagation of light through the fibers- Numerical aperture , Acceptance angle and Acceptance cone -Fiber types: Refractive index profile and ray propagation-Step and graded index fibers -Attenuation in fibers: Attenuation coefficient and different loss mechanisms.

Unit – V Applications of fibers: **(9hours)**

Fiber optic communication system(block diagram)- Sensing applications of fibers: Pressure sensor, Liquid level sensor, Displacement sensor, Chemical sensor – Optical fibers in medicine (endoscopes) - Optical fibers in computer networks (block diagram).

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(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

Course Outcomes		POs related to COs
CO1	**Acquire** the basic knowledge on LASERS	PO1, PO12
CO2	**Understand** different types of LASERS	PO1, PO12
CO3	**Develop** knowledge on different applications of LASERS	PO1, PO12
CO4	**Acquire** the basic knowledge on Optical Fibers	PO1,PO12
CO5	**Develop** knowledge on different applications of Optical Fibers	PO1,PO12

Text Book:

1. Lasers Theory and Applications By K.Thyagarajan and A.K.Ghatak: Macmillan India Limited, New Delhi.
2. Lasers And non-Linear Opics, second edition,By BBLaud. NewAge International(P) limited,Publishers,New Delhi,

Reference Books:

1. An Introduction to Fiber Optic Systems ,Second Edition,By John Powers,Richard D Irwin ,a Times Mirror Higher education,Inc Company,USA,
2. Physics for Engineers - M.R.Srinivasan , New Age International, 2009

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	3
CO2	3	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	-	-	-	-	-	-	-	-	-	3
CO4	3	-	-	-	-	-	-	-	-	-	-	3
CO5	3	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	-	-	-	-							**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-II SEM (OE) | **L T P C**

OBJECT ORIENTED PROGRAMMING | **3 0 0 3**

SUB CODE: 18OCSE321 **(OPEN ELECTIVE-1)**

Course Educational Objectives:

1: To study the syntax, semantics and features of Java Programming Language.

2: To understand the principles of packages and inheritance.

3: To develop Java application programs using exceptions and interfaces.

4: To gain knowledge on multithreading and applets

5: To create GUI applications & perform event handling.

UNIT – 1 Basics of Java (9hours)

History of Java - Java Buzzwords - Overview of Java - Data Types - Variables - Arrays - Operators - Control Statements – Introducing Classes &Objects - Constructors - Methods - Access Control – this Keyword - Garbage Collection - Overloading Methods and Constructors - Parameter Passing - Recursion – Reading input-Command Line Arguments – Buffer Reader – Scanner.

UNIT – 2 String Handling, Inheritance and Packages (9 hours)

String Handling-Using String Class – String Buffer Class Inheritance-Basics of Inheritance-Using super-Creating a multilevel hierarchy-Method overriding- Dynamic method dispatch - Using abstract classes -Using final. Packages-Defining - Creating and Accessing a Package - Understanding CLASSPATH – Importing Packages - Exploring Packages.

UNIT – 3 Interfaces and Exception Handling (8 hours)

Interfaces- Differences between Classes and Interfaces - Defining an Interface – Implementing Interface - Applying Interfaces - Variables in Interfaces and Extending Interfaces. Exception Handling- Introduction – Exception Types – Uncaught Exception – Using Try and Catch – Multiple Catch clauses – Nested Try Statements – Throw – Throws – Finally – Built-in Exceptions – Creating Own Exception Subclass – Checked and Unchecked Exceptions.

UNIT – 4 Multithreading and Applets (10 hours)

Multithreading -Differences between Multithreading and Multiprocessing - Thread Life Cycle - Creating Threads - Synchronizing Threads. Applets- Concepts of Applet - Differences between Applet and Application - Life Cycle of an Applet- Types of Applets - Creating Applet - Passing Parameters to Applet – Using Graphics Class.

UNIT – 5 Event Handling and AWT and Swings (9 hours)

EVENT HANDLING A ND AWT - Delegation Event Model - Event Classes - Sources of Events - Event Listeners - Handling Mouse and Keyboard Events - Adapter Classes - Inner Classes - The AWT Class Hierarchy - AWT Controls : Label – Button – Text Field -

Checkbox - Layout Managers. Swings - Limitations of AWT – Components - Containers - Exploring Swing - JApplet - JFrame and JComponent - JLabel and Imageicon –JTextfield - JButton - JCheck Box - JRadioButton - JCombobox - JTabbedpane - JScrollpane - JTable.

Course Outcomes:

On Successful completion of this course student will be able to :

Course Outcomes		POs related to COs
CO1	Understand the basic principles of object oriented programming	PO1, PO2, PO3, PO4, PO5, PO12
CO2	Develop Java programs with the concepts of inheritance and packages	PO1, PO2, PO3, PO4, PO5, PO12
CO3	Build Java applications using exceptions and interfaces	PO1, PO2, PO3, PO4, PO5, PO12
CO4	Use multithreading and applet concepts in developing the object oriented programming	PO1, PO2, PO3, PO5
CO5	Develop the interactive Java programs using event handling and swings	PO1, PO2, PO3, PO5

Text Books:

1. Java; The complete reference, Herbert schildt, 11th editon, TMH.
2. Beginning Java2 JDK , Ivor Horton's, 5 th Edition, WILEY Dream Tech.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley& sons.
2. An Introduction to OOP, T. Budd, second edition, Pearson education.
3. Introduction to Java programming ,Y. Daniel Liang, 6 th edition, Pearson education.
4. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, 7 th Edition, Pearson Education.

CO-PO Mapping

CO-PO	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	P010	PO11	PO12
CO1	3	3	3	2	2	-	-	-	-	-	-	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2
CO3	3	3	2	3	3	-	-	-	-	-	-	2
CO4	3	3	2	-	3	-	-	-	-	-	-	-
CO5	3	3	2	-	3	-	-	-	-	-	-	-
CO*	**3**	**3**	**2.4**	**2.6**	**2.8**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-II SEM (OE) | **L T P C**

OPERATING SYSTEM | **3 0 0 3**

SUB CODE: 18OCSE322 **(OPEN ELECTIVE-I)**

Course Educational Objectives:

1:To understand main components of OS, System structures and the operations performed by OS as a resource manager.
2:To Study process concurrency and synchronization.
3:To Analyze the different memory management techniques.
4:To gain knowledge about concepts of input/ output systems and storage management
5:To manage different file systems, protection and security to the systems

UNIT – 1: Operating Systems Overview (10 hours)

Introduction - What Operating system do - Operating system operations - Process management - Memory management - Storage management - Protection and Security - Distributed Systems - Special purpose systems.
System structures : Operating system services - user operating system interface - System calls - Types of system calls - Operating system design and implementation - Operating system structure - Operating system generation - System boot.

UNIT - 2 : Process Management and Concurrency (8 hours)

Process Management: Process concepts – threads - scheduling-criteria – algorithms and their evaluation - Thread scheduling.
Concurrency : Process synchronization - the critical- section problem - Peterson's Solution - synchronization Hardware – semaphores - classic problems of synchronization - monitors.

UNIT – 3: Memory Management (9 hours)

Memory Management and Virtual Memory : Logical & physical Address Space – Swapping - Contiguous Allocation – Paging - Structure of Page Table – Segmentation - Virtual Memory - Demand Paging - Performance of Demanding Paging - Page Replacement - Page Replacement Algorithms - Allocation of Frames - Thrashing.

UNIT – 4: Principles of deadlock AND Mass-storage structure & I/O systems (9 hours)

Principles of deadlock - system model - deadlock characterization - deadlock prevention - detection and avoidance - recovery form deadlock.
Mass-storage structure - overview of Mass – storage structure - Disk structure - disk attachment - disk scheduling - swap-space management - RAID structure - stable-storage implementation - Tertiary storage structure.

UNIT - 5 : File system Interface (9hours)

File system Interface- the concept of a file - Access Methods - Directory structure - File system mounting - file sharing – protection - File System implementation - File system structure - file system implementation - directory implementation - allocation methods

- free-space management - efficiency and performance.Protection and Security - Goals of protection - Principles of protection - Access matrix - The security problem - program threats - System and network threats.

Course Outcomes:

On successful completion of this course, student will be able to:

Course Outcomes		**POs related to COs**
CO1	Analyze operating system operations ,system design and implementation	PO1, PO2
CO2	Implement Thread scheduling , solutions to synchronize problems	PO1, PO4,
CO3	Apply memory management techniques, virtual memory concepts	PO1,PO3,PO4
CO4	Manage process execution without deadlock, mass storage structure	PO1,PO4
CO5	Understand file system interface, protection and security in System and Network	PO1, PO2, PO4

Text Books:

1. Operating System Principles,8th Edition, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley Student Edition.
2. Operating systems - Internals and Design Principles, 6th Edition,W. Stallings, Pearson.

References books:

1. Modern Operating Systems, 3rd Edition ,Andrew S Tanenbaum PHI.
2. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
4. Operating Systems, 2nd Edition,A. S. Godbole, TMH
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.

CO-PO Mapping

PO-CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**P012**
CO1	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**2**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO*	**2.6**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-II SEM (OE) **L T P C**

WEB PROGRAMMING **3 0 0 3**

SUB CODE: 18OCSE323 **(OPEN ELECTIVE-I)**

Course description and objectives:

On completion of this course, a student will be

1: To familiar with client server architecture and able to develop a web application using java technologies.

2: To gain the skills and project-based experience needed for entry into web application and development careers.

3. ToDevelop a dynamic webpage by the use of java script and DHTML.

4. To know the concept of a server side java application called Servlet.

5. To know the concept a server side java application called JSP.

Unit I Introduction to HTML **(9hours)**

HTML Common tags- Block Level and Inline Elements, Lists,Tables, Images, Forms, Frames; Cascading Style sheets, CSS Properties;

Java Script: Introduction to Java Script, Objects in Java Script, Dynamic HTML with Java Script

Unit II Java Data Base Connectivity **(9hours)**

JDBC: Data Base, Database Schema, A Brief Overview Of The JDBC Process, JDBC Driver Types, JDBC Packages, Database Connection, Associating The JDBC-ODBC Bridge With Database, Creating, Inserting, Updating And Deleting Data In Database Tables, Result Set, Metadata.

Unit III Web Servers and Servlets **(11hours)**

Tomcat web server, Introduction to Servlets: Servlets, the Advantage of Servlets over "Traditional" CGI, Basic Servlet Structure, Simple Servlet Generating Plain Text, Compiling and Installing the Servlet, Invoking the Servlet, Lifecycle of a Servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Context Parameters, Handling Http Request & Responses, Using Cookies-Session Tracking, Servlet with JDBC.

Unit IV Introduction to JSP: **(8hours)**

Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing, JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Declaring Variables and Methods , Sharing Data Between JSP pages, Users Passing Control and Data between Pages, JSP application design with JDBC, JSP Application Design with MVC.

Unit V Introduction to PHP **(8hours)**

Basics of PHP, Functions, Error Handling, Interaction between PHP and MySQL, Database using Forms,Using PHP to manipulate and Retrieve Data in MySQL.

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to Cos**
CO1	Write a well formed / valid XML document.	PO1, PO2, PO3, PO5
CO2	Connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.	PO1, PO2, PO3, PO5
CO3	Develop a dynamic webpage by the use of java script and DHTML.	PO1, PO2, PO3
CO4	Write a server side java application called Servlet to catch form data sent from client, process it and store it on database.	PO1, PO2, PO3, PO5
CO5	Write a server side java application called JSP to catch form data sent from client and store it on database	PO1, PO2, PO3, PO5

TEXT BOOKS:

1. Jon Duckett “Beginning Web Programming with HTML, XHTML, and CSS (Wrox Programmer to Programmer)
2. Marty Hall and Larry Brown “Core Servlets and Java Server pages Vol. 1: Core Technologies”, Pearson.

REFERENCE BOOKS:

1. DanWoods and GautamGuliani,”Open Source for the Enterprise: Managing Risks, Reaping Rewards”, O’Reilly, Shroff Publishers and Distributors, 2005.
2. Sebesta,”Programming world wide web” Pearson.
3. Dietel and Nieto,“Internet and World Wide Web – How to program”,PHI/Pearson Education Asia.
4. Murach,“Murach’s beginning JAVA JDK 5”, SPD
5. Wang,“An Introduction to web Design and Programming”,Thomson.

CO-PO Mapping

PO-CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	3	-	-	-	-	-	-	-
CO2	2	3	3	-	3	-	-	-	-	-	-	-
CO3	2	3	3	-	3	-	-	-	-	-	-	-
CO4	2	3	3	-	3	-	-	-	-	-	-	-
CO5	3	3	-	2	3	-	-	-	-	-	-	-
CO*	**2.4**	**2.8**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III B.Tech II Semester

L	T	P	C
2	1	0	3

18OCIV321: CONSTRUCTION AND PROJECT MANAGEMENT

Course Educational Objectives:

1. To study the fundamentals of construction technology
2. To study the earth work methods
3. To study the concepts of project management and milestones
4. To study the concept of elements of network and development of network
5. To study the concept of network analysis

UNIT I: FUNDAMENTALS OF CONSTRUCTION TECHNOLOGY (9 hours)

Definitions and Discussion – Construction Activities – Construction Processes - Construction Works – Construction Estimating – Construction Schedule – Productivity and Mechanized Construction – Construction Documents – Construction Records – Quality – Safety – Codes and Regulations

UNIT II: EARTHWORK (9 hours)

Classification of Soils – Project Site – Development – Setting Out - Mechanized Excavation – Groundwater Control – Trenchless (No-dig) Technology – Grading – Dredging**.**

Excavation By Blasting: Rock Excavation – Basic Mechanics of Breakage – Blasting Theory – Drillability of Rocks – Kinds of Drilling – Selection of the Drilling Method and Equipment – Explosives – Blasting Patterns and Firing Sequence – Smooth Blasting – Environmental Effect of Blasting.

UNIT III: PROJECT MANAGEMENT AND BAR CHARTS AND MILESTONE CHARTS (9 hours)

Introduction – Project planning – Scheduling – Controlling – Role of decision in project management – Techniques for analyzing alternatives Operation research – Methods of planning and programming problems Development of bar chart – Illustrative examples – Shortcomings of bar charts and remedial measures – Milestone charts – Development of PERT network problems.

UNIT IV: ELEMENTS AND DEVELOPMENT OF NETWORK: **(9hours)**

Introduction – Event – Activity – Dummy – Network rules – Graphical guidelines for network – Common partial situations in network – Numbering the events – Cycles Problems – Planning for network construction – Modes of network construction – Steps in development of network – Work breakdown structure –Hierarchies – Illustrative examples – Problems.

UNIT V: NETWORK ANALYSIS (9 hours)

CPM : process – CPM : Networks – Activity time estimate – Earliest event time – Latest allowable occurrence time – Combined tabular computations for TE and TL - Start and finish times of activity – Float – Critical activities and critical path – Illustrative examples Problems.

TOTAL: 45 HOURS

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes:

On successful completion of the course the student will be able to,		**POs related to COs**
CO1	Apply theoretical and practical aspects of project management techniques to achieve project goals.	PO1,PO3
CO2	Exhibit organizational and leadership capabilities for effective management of construction projects.	PO2,PO3
CO3	Apply knowledge and skills of modern construction practices and techniques.	PO2,PO5, P11
CO4	Demonstrate the basic of project management	PO2 PO4
CO5	Develop the network for construction projects and examine the critical path	PO2,PO3

Text Books:

1. Construction Technology by SubirK.Sarkar and SubhajitSaraswati – Oxford Higher Education- Univ.Press, Delhi.
2. Project Planning and Control with PERT and CPM by Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications New Delhi.
3. Construction project management by Jha, Pearson pubilications, New Delhi

Reference Books:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.
2. Total Project management, the Indian context- by: P.K.Joy- Mac Millan Publishers India Limited.

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	-	3	-		-	-	-	-	-	-	-
CO2	-	2	3	-		-	-	-	-	-	-	-
CO3	-	2	-	-	2	-	-	-	-	-	1	-
CO4	-	2	-	2		-	-	-	-	-	-	-
CO5	-	2	2			-	-	-	-	-	-	-
CO*	**1**	**2**	**2.6**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III B.Tech II Semester

L	T	P	C
3	0	0	3

18OCIV322 REMOTE SENSING AND GIS

Course Educational Objectives:

1. To know the basics, importance, analysis and applications of RS and GIS
2. To study the various types of operating systems of RS and GIS
3. To know the applications of RS and GIS

UNIT I: INTRODUCTION TO REMOTE SENSING (10 hours)

Concept and scope of remote sensing: Definitions, Process and Characteristics of Remote Sensing System, Advantages and limitations.

Concept of electromagnetic radiation (EMR): Wavelength-frequency-energy relationship of EMR, EMR Spectrum and its properties, EMR wavelength regions and their applications, Spectral signatures.

Energy interaction in the atmosphere and with earth surface features: Scattering, absorption, transmission, atmospheric windows Spectral Reflectance Curve, Concept of signatures.

UNIT II: PLATFORMS AND SENSORS (12 hours)

Introduction: Sensor materials, Sensor System - Framing and Scanning System, Whiskbroom scanners, Push-broom scanners.

Types and characteristics of sensor: Imaging and non-imaging sensors, Active and passive sensors, Resolution of Sensors - Spectral, Spatial, Radiometric & Temporal, Scale, Mapping unit, Multi-band concepts and False Colour Composites.

Remote sensor platforms and satellite orbits: Ground, Airborne and Space borne Platforms, Orbital Characteristics – Coverage, Passes, Pointing Accuracy, Geostationary, Sun synchronous, shuttle orbit.

Space imaging satellites: Early history of space imaging; Multispectral and Hyperspectral sensors, Radar, Lidar; Specification of some popular satellites – IRS, Landsat and SPOT series; High resolution satellites – IKONOS, Cartosat, Quick bird, Orb View, Geo Eye, Pléiades, World View; Other latest earth resource satellites.

UNIT III: REMOTE SENSING APPLICATIONS (9 hours)

Scope of Remote Sensing Applications - Potentials and Limitations. Applications in land use and land cover analysis. Resource evaluation **-** Soils, forest and agriculture.Water Resource Applications- Mapping, monitoring of surface water bodies, tanks, lakes/reservoirs.Environmental applications.

UNIT IV: GEOGRAPHIC INFORMATION SYSTEM (7 hours)

Basic Concepts: Definition of GIS, Components of GIS, Variables - points, lines, polygon, Functionality of GIS, Areas of GIS application, Advantage and Limitation of GIS

UNIT V: GIS DATA (7 hours)

Spatial and Attribute Data, Information Organization and Data Structures – Raster and Vector data structures, Data file and database

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Creating GIS Database: GIS Software's, file organization and formats, Geo-database, Database model, Rectification, Digitization and Map Composition

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course the student will be able to,		**POs related to COs**
CO1	Explain the principles and applications of Remote Sensing and various types of platforms used in Remote Sensing.	PO1, PO2, PO3,
CO2	Understand the principles of remote sensing and digital image processing;	PO1
CO3	Understand the principles of geographic information systems (GIS)	PO1, PO2, PO4,
CO4	Demonstrate the applications of remote sensing and GIS to solving problems in the environmental and life sciences;	PO1, PO3
CO5	Demonstrate the use of image processing and GIS software	PO3

Text Books:

1. Text Book of Remote Sensing and Geographic Information System, M. Anji Reddy, BS Publication.
2. Concepts and Techniques of GIS, Lo C.P. &Yeung A.K.W., Prentice-Hall of India, New Delhi, 2004

Reference Books:

1. Remote sensing and Geographic Information System, B.Bhatta, Oxford Publications.
2. Introduction to Geographical Information System, Siddiqui, M.A., ShardaPustak , Bhavan, Allahabad, 2006
3. Principles of Remote Sensing, Curran, Paul J, Longman, London, 1985.
4. Data User Handbook, NRSA, IRS, Hyderabad

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	2	2									
CO2	3											
CO3	1	2		2								
CO4	1		2									
CO5			2									
CO*	**1.5**	**2**	**2**	**2**								

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III B.Tech II Semester

L	T	P	C
3	0	0	3

18OCIV323 GREEN BUILDINGS AND ENERGY CONSERVATION

Course Educational Objectives:

1. To introduces green building concepts.
2. To explain the design process of green buildings
3. To teach the thermal flow in buildings
4. To demonstrate the materials required .for green house construction
5. To analyze the costs involved in green buildings

UNIT 1: GREEN BUILDING CONCEPTS (9hours)

Orientation – Introduction to bioclimatic architecture, sustainability in building science functional planning – Elements of building design and drawing, regulations and bylaws –Traditional Vs vernacular architecture – Climate zones, design charts, sun path diagram, solar angles, indices of thermal comfort, vernacular buildings in different climate zones.

UNIT 2: CLIMATE RESPONSIVE SCIENTIFIC PROCESS OF DESIGN (9 hours)

Introduction, various steps, site planning , plan form building envelope landform, topography, vegetation, water bodies; orientation, S/V ratio, P/A ratio, walls, fenestration, roof and floors active Vs passive, passive solar architecture.

UNIT 3: THERMAL FLOW IN BUILDINGS (9 hours)

Calculation of thermal conductance, heat flow through different building elements; various software ventilation and day lighting – Design and placement of openings – Water management in buildings techniques to recycle, reuse and harvest water.

UNIT 4: GREEN BUILDING MATERIALS AND CONSTRUCTION (9 hours)

Material properties, energy efficiency using various materials, emerging new materials construction techniques – Techniques for roof, wall and foundations.

UNIT 5: ECONOMY OF GREEN BUILDING (9 hours)

Cost of building, operation and maintenance – Green building rating system, evaluation criteria of LEED, TERI GRIHA case studies, and case studies in different climate zones.

TOTAL: 45 HOURS

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course outcomes:

On successful completion of the course the student will be able to,		**POs related to COs**
CO1	Explain the green building concepts	PO1
CO2	explain the design process of green buildings	PO1
CO3	Demonstrate the thermal flow in buildings	PO1, PO2
CO4	Demonstrate the materials required .for green house construction	PO1,
CO5	Identify the costs involved in green buildings	PO1

Text books:

1. Climate Responsive Architecture, A Design Handbook For Energy Efficient Buildings, Krishnan, A., Baker, N., Yannas, S., and Szokolay, S., Eds., 2001, Tata McGraw–HillPublishing Company, New Delhi.
2. Sustainable building design manual (Vol.II), TERI & ICAEN (InstitutCataladEnergia), 2004, The Energy and Resources Institute (TERI) Press, New Delhi.

Reference Books:

1. Bureau of Indian Standards, SP:41, Handbook on Functional Requirements of Buildings (Other Than Industrial Buildings) 1/e rp,1995, Bureau of Indian Standards, New Delhi.
2. Indian Green Building Council, LEED-India, 2011, LEED 2011 for India- Green building Rating system, abridged reference guide for new construction and major renovations (LEED India NC). Hyderabad: Indian Green Building Council.
3. Manual of Tropical Housing and Building, Koenigsberger, O., ingersoll, T. G., Mayhew, A., &Skozolay, S. V., 2011, Universities Press, Hyderabad.
4. Building Design and Drawing, Prabhu, Balagopal T S, K Vincent Paul, and C Vijayan, 2008, Calicut:Spades Publishers.

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2	3											
CO3	3	2										
CO4	3											
CO5	3											
CO*	**3**	**2**										

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
(Autonomous)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III B.Tech II Semester

L	T	P	C
3	0	0	3

18OMEC321 INDUSTRIAL ROBOTICS (OPEN ELECTIVE-I)

Course Educational Objectives:

1. To know the robot drive systems and internal grippers and external grippers
2. To understand the image processing and analysis of image data
3. To learn Robot motion analysis and control.
4. To study the robot language structure and programming
5. To explain the various applications of robots in industry

UNIT – 1: FUNDAMENTALS OF ROBOTIC TECHNOLOGY AND DRIVE SYSTEM (9hours)

Introduction – Robot anatomy – Robot configuration and motions – Robot specifications – Pitch, yaw, roll, joint notations, speed of motion, pay load – Work volume. **Robot Drive System:** Pneumatic, hydraulic drives, mechanical and electrical drives – Servo motors and stepper motor. **Grippers:** Mechanical, pneumatic and hydraulic grippers, magnetic grippers and vacuum grippers – Two fingered and three fingered grippers – Internal and external grippers.

UNIT – 2: ROBOT SENSORS AND MACHINE VISION (9hours)

Robot Sensors: Position of sensors – Range sensors – Proximity sensors – Touch sensors – Wrist sensors – Compliance sensors – Slip sensors. **Machine Vision**: Camera – Frame grabber – Sensing and digitizing image data – Signal conversion – Image storage and lighting techniques – Image processing and analysis – Data reduction – Edge detection – Segmentation feature extraction – Object recognition.

UNIT – 3: ROBOT MOTION ANALYSIS AND CONTROL (11 hours)

Robot Kinematics: Manipulator kinematics – Position representation – Forward and reverse transformation – Adding orientation – Homogeneous transformations – D-H notation – Forward and inverse kinematics. **Robot Dynamics:** Differential transformation – Compensating for gravity – Robot arm dynamics. **Trajectory Planning:** Trajectory planning and avoidance of obstacles – Path planning – Skew motion – Joint integrated motion – Straight line motion.

UNIT – 4: ROBOT PROGRAMMING (9 hours)

Robot Programming: Lead through programming – Robot language structure – Motion commands of move, speed control, workplace, path, frames, end effecter operation, sensor operation and react statement – Program sequence and subroutine – Teach pendant programming – VAL II programming.

UNIT – 5: ROBOT APPLICATIONS AND IMPLEMENTATION PRINCIPLES (7 hours)

Robot Applications: Material transfer and machine loading / unloading – Processing applications in spray coating – Assembly and inspection automation – Future applications of robot in mines, under water and space. **Implementation Principles:** Selection of robots in industry applications – Economic analysis of the robot.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the robot drive systems and internal grippers and external grippers.	**PO1**
CO2	Recognize the image data and analysis the image processing	**PO1, PO12**
CO3	Understand the basic concepts of robot motion and analysis	**PO1,PO2,PO3**
CO4	Know the robot language structure and robot programming.	**PO1,PO2, PO3, PO12**
CO5	Explain the applications of robots in industries and Safety considerations in workplace	**PO1,PO11, PO12**

Text Books:

1. Industrial Robotics: Technology, Programming and Applications, Mikell P Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G Odrey and Ashish Dutta 2/e, 2012, Tata McGraw-Hill Education Pvt. Ltd.,
2. Robotics: Control, Sensing, Vision and Intelligence, K.S. Fu, R.C.Gonzales and C.S.G.Lee, 1/e, 2008, Tata McGraw-Hill Education Pvt. Ltd., Noida.

References:

1. Introduction to Robotics: Analysis, Control, Applications, 3/e, 2020, Saeed B.Niku, Wiley India Pvt, Ltd., New Delhi.
2. Robotics Technology and Flexible Automation, S.R.Deb and Sankha Deb, 2/e, 2010, Tata McGraw-Hill Education Pvt. Ltd., Noida.
3. Robots and Robotics - Principles, Systems, and Industrial Applications, Mark R Miller & Rex Miller 2017, McGraw-Hill Education.
4. Introduction to Robotics: Mechanics and Control, John J. Craig, 3/e, 2008, Pearson Education, New Delhi.
5. Robotics: Fundamental Concepts and Analysis, Ashitava Ghosal, 1/e, 2006, Oxford University Press, New Delhi.
6. Robotics and Industrial Automation, Rajput R.K, 2008, S.Chand Publications, New Delhi.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	3	-	-	-	-	-	-	-	-	-	-	1
CO.3	3	2	1	-	-	-	-	-	-	-	-	-
CO.4	3	2	1	-	-	-	-	-	-	-	-	1
CO.5	3	-	-	-	-	-	-	-	-	-	1	1
CO*	**3**	2	1	-	-	-	-	-	-	-	1	1

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
(Autonomous)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III B.Tech II Semester

L	T	P	C
3	0	0	3

18OMEC322 POWER PLANT TECHNOLOGY (OPEN ELECTIVE-I)

Course Educational Objectives:

1. To understand the working principles of steam power plants and analyzes its performance.
2. To know the working principles of diesel and gas turbine power plant
3. To clarify the working of nuclear power plant and safety measures
4. To recognize the sources of renewable energies and hydroelectric power generation techniques.
5. To learn the economics, Energy management and environmental issues of power generation.

UNIT – 1: STEAM POWER PLANT **(9** hours**)**

Rankine cycle – Layout of modern coal power plant – Super critical boilers, FBC Boilers, turbines, condensers, steam and heat rate – Subsystems of thermal power plants – Fuel and ash handling – Draught system – Feed water treatment – Binary cycles and cogeneration systems.

UNIT – 2: DIESEL AND GAS TURBINE POWER PLANT **(9** hours**)**

Diesel Power Plant: Introduction – IC Engines, types, construction – Plant layout with auxiliaries – Fuel supply system, air starting equipment, lubrication and cooling system – Super charging. **Gas Turbine Power Plant**: Introduction – Classification – Construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines – Combined cycle power plants and comparison.

UNIT – 3: NUCLEAR POWER PLANT **(9** hours**)**

Basics of nuclear engineering– Fuels and nuclear reactions – Layout and subsystems – Reflectors – Pressurized water reactor (PWR) – Boiling water reactor (BWR) – CANada Deuterium- Uranium reactor (CANDU) – Gas cooled and liquid metal fast breeder reactor – Heavy water reactor – Working and comparison – Safety measures for nuclear power plants.

UNIT – 4: HYDROELECTRIC POWER PLANT AND RENEWABLE ENERGY SOURCE (9 hours**)**

Hydroelectric Power Plant: Water power – Hydrological cycle – Hydrographs – Storage and pondage – Classification of dams and spill ways – Hydroelectric typical plant layout and components – Pumped storage power plants – Selection of turbines. **Renewable Energy Sources:** Principle, construction and working of wind, tidal, solar photo voltaic, solar thermal, geo thermal, biogas and fuel cell systems.

UNIT – 5: ENERGY MANAGEMENT, ECONOMICS AND ENVIRONMENTAL ISSUES (9 hours**)**

Energy Management: Power tariff types – Load distribution parameters – load curve – Comparison of site selection criteria, relative merits and demerits – Capital and operating cost of different power plants. **Environmental Issues:** Effluents from power plants – Impact on environment – Pollutants – Pollution standards – Methods of Pollution control – Control of waste disposal and recovery – Waste disposal options for coal and nuclear power plants.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the working principles of steam power plants and analyze performance	**PO1,PO2,PO3, PO6, PO7, PO12**
CO2	Understand the working principles of diesel and gas turbine power plant	**PO1,PO3, PO6, PO7,PO12**
CO3	Explain the working of nuclear power plant with safety measures	**PO1,PO2,PO3, PO6, PO7, PO12**
CO4	Explain the working power generation technologies from various renewable energy sources and hydroelectric power generation system	**PO1,PO2,PO3, PO6, PO7, PO12**
CO5	Describe environmental issues of power generation.	**PO1,PO2,PO3, PO6, PO7, PO12**

Text books:

1. Power Plant Engineering, P.K.Nag, 4/e, 2014, McGraw-Hill Education Pvt. Ltd., New Delhi.
2. Power Plant Engineering, R.K Hegde, 1/e, 2015, Pearson Education, India.

Reference books:

1. Power Plant Technology, M. M. El-Wakil, 1/e, 2010, Tata McGraw-Hill, New Delhi.
2. A Course in Power Plant Engineering, Arora and S. Domkundwar, 6/e, 2012, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
3. Introduction to Power Plant Technology, G.D.Rai, 3/e, 2012, Khanna Publishers, New Delhi.
4. Power Plant Engineering, G.R. Nagpal and S.C. Sharma, 16/e, 2004, Khanna Publisher, New Delhi.
5. A Text Book of Power Plant Engineering, R.K.Rajput, 5/e, 2016, Laxmi Publications (P) Ltd., New Delhi.
6. Power Generation Handbook, Philip Kiameh, 2/e, 2013, Tata McGraw-Hill, New Delhi.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	2	-	-	1	1	-	-	-	-	1
CO.2	3	-	2	-	-	1	1	-	-	-	-	1
CO.3	3	2	1	-	-	1	1	-	-	-	-	1
CO.4	3	2	1	-	-	1	1	-	-	-	-	1
CO.5	3	2	1	-	-	1	3	-	-	-	-	2
CO*	**3**	**2**	**1.4**	-	-	**1**	**1.2**	-	-	-	-	**1.5**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
(Autonomous)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III B.Tech II Semester

L	T	P	C
3	0	0	3

18OMEC323 MECHATRONICS SYSTEM (OPEN ELECTIVE-I)

Course Educational Objectives:

1. To recognize the fundamentals of Mechatronics, Control Systems, Transducers and Sensors
2. To understand the functions of Mechanical, Electrical, Hydraulic, and Pneumatic Actuators.
3. To express the Basic system models and Controllers used in Mechatronic systems
4. To realize the applications of microprocessors and Programmable Peripheral Interface
5. To recognize the Elements of programmable logic controller in mechatronic system

UNIT – 1: MECHATRONICS, SENSORS AND TRANSDUCERS (9 hours)

Introduction: Integrated design issues in mechatronics – Mechatronics key elements – Applications in mechatronics – Introduction to mechatronics systems and measurement systems. **Control Systems:** Open loop, closed loop, automatic control, block diagram, pneumatic control and hydraulic control systems. **Transducers:** Actuating mechanisms – Electro-mechanical, resistance, variable inductance, capacitive, piezoelectric, photoelectric, thermo electric and Hall Effect transducers – Strain gauge. **Sensors:** Proximity, pneumatic, light, tactile and smart sensors – Load cells – Digital encoders – Selection of sensors.

UNIT – 2: ACTUATIORS (9 hours)

Mechanical Actuator: Gear drive, belt drive, chain drive and bearings. **Electrical Actuator:** Mechanical and solid state switches – Construction and working principle of stepper motor and servo motor. **Hydraulic Actuators:** Hydraulic systems – Pumps, regulator, compressors and valves – Linear and rotary actuator. **Pneumatic Actuators:** Pneumatic systems – Valves – Linear and rotary actuator.

UNIT – 3: SYSTEM MODELS AND CONTROLLERS (9 hours)

System Models: Basic system models – Mechanical system buildings – Electrical system buildings – Fluid system buildings – Thermal system buildings – Rotational-translational systems – Electro mechanical systems – Hydraulic mechanical systems. **Controller:** Control, two step, proportional and derivative mode – Combination of PD, PI and PID – PID and igital controllers – Concepts in adaptive control systems.

UNIT – 4: MICROPROCESSORS AND PROGRAMMABLE PERIPHERAL INTERFACE(9 hours)

Microprocessors: Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontroller with block diagram. **Programmable Peripheral Interface:** Architecture of 8255 – Keyboard interfacing – LED display – Interfacing – ADC and DAC interface – Temperature control – Stepper motor control – Traffic control interface.

UNIT– 5: PROGRAMMABLE LOGIC CONTROLLER & MECHATRONIC SYSTEMS (9 hours)

Programmable Logic Controller: Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC. **Mechatronic Systems:** Design process of engine management system, automatic camera, automatic washing machine, pick and place robot, automatic car

park barrier, wireless surveillance balloon, uninterruptible power supply, coin counter and electrically controlled robotic arm.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the fundamentals of Mechatronics, Control Systems, Transducers and Sensors	**PO1, PO2**
CO2	Illustrate the functions of Mechanical, Electrical, Hydraulic, Pneumatic Actuators in mechatronics systems	**PO1, PO2, PO3**
CO3	demonstrate the Basic system models and Controller used in Mechatronic systems	**PO1, PO2**
CO4	Understand the applications of microprocessors and and Programmable Peripheral Interface	**PO1, PO2**
CO5	Know the Elements of programmable logic controller in mechatronic system	**PO1, PO2, PO3**

Text Books:

1. Mechatronics: Electronic control systems in mechanical and electrical engineering, William Bolton, 6/e, 2019, Pearson Education, India.
2. A Textbook of Mechatronics, R.K.Rajput, 4/e, 2007, S. Chand & Co.

Reference Books:

1. Mechatronics Systems Design, Devdas Shetty and Richard A. Kolk, 2/e, 2011, Cengage Learning.
2. Mechatronics, Principles and Applications, Godfrey Onwubolu, 1/e, 2005, Elsevier Butterworth-Heinemann.
3. Introduction to Mechatronics and Measurement Systems, David G. Alciatore and Michael B. Histand, 4/e, 2014, Tata McGraw Hill Education.
4. Mechatronics: A Foundation Course, Clarence W. de Silva, 1/e, 2010, CRC Press, Taylor & Francis Group
5. Mechatronics with Experiments, Sabri Cetinkunt, 2/e, 2015, John Wiley & Sons Ltd

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	-
CO.2	3	2	1	-	-	-	-	-	-	-	-	-
CO.3	3	2	-	-	-	-	-	-	-	-	-	-
CO.4	3	2	-	-	-	-	-	-	-	-	-	-
CO.5	3	2	1	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**1**	-	-	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
(Autonomous)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III B.Tech II Semester

	L	T	P	C
MACHINE VISION SYSTEM	**3**	**0**	**0**	**3**

SUB CODE: 18OECE321 **(OPEN ELECTIVE-I)**

Course Educational Objectives:

1: To introduce theory, applications and techniques of machine vision to students
2: Provide the students with an understanding of the problems involved in the development of machine vision systems.
3: Introduces the "low-level" algorithms of image processing that are necessary for the "mid-level" vision or feature extraction.
4: To describe and analyze the pattern recognition, and 3D analysis and modeling of objects and scenes.
5: lay emphasis on the practical integration of machine vision systems, and the related applications in real time.

UNIT- 1: Introduction **(9hours)**

Human vision – Machine vision and Computer vision – Benefits of machine vision - Block diagram and function of machine vision system implementation of industrial machine vision system – Physics of Light – Interactions of light – Refraction at a spherical surface – Thin Lens Equation

UNIT- 2: Image Acquisition **(9hours)**

Scene constraints – Lighting parameters – Lighting sources, Selection – Lighting Techniques – Types and Selection – Machine Vision Lenses and Optical Filters, Specifications and Selection – Imaging Sensors – CCD and CMOS, Specifications – Interface Architectures – Analog and Digital Cameras – Digital Camera Interfaces – Camera Computer Interfaces, Specifications and Selection – Geometrical Image formation models – Camera Calibration, line and progressive scan.

UNIT- 3: Image Processing **(9hours)**

Machine Vision Software – Fundamentals of Digital Image – Image Acquisition Modes – Image Processing in Spatial and Frequency Domain – Point Operation, Thresholding, Grayscale Stretching – Neighborhood Operations, Image Smoothing and Sharpening – Edge Detection – Binary Morphology.

UNIT-4: Image Analysis

(9hours)

Feature extraction – Region Features, Shape and Size features – Texture Analysis – Template Matching and Classification – 3D Machine Vision Techniques – Decision Making.

UNIT-5: Machine Vision Applications

(9hours)

Machine vision applications in manufacturing, electronics, printing, pharmaceutical, textile, applications in non-visible spectrum, metrology and gauging, OCR and OCV, vision guided robotics – Field and Service Applications – Agricultural, and Bio medical field, augmented reality, surveillance, bio-metrics, automobile industries, Food packaging industry, research and aeronautics.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Formulate the concepts of machine vision system and its applications	PO1, PO2
CO2	Determine the geometrical image formation model and analyze the lighting effects for image acquisition	PO1,PO2
CO3	Demonstrate various the image acquisition and processing techniques in spatial and frequency domain	PO1, PO2,PO3
CO4	Analyze the digital image for feature extraction and 3D vision techniques for decision making.	PO1, PO2,PO3, PO4
CO5	Apply machine vision concepts and visual sensing technologies in real time applications	PO1, PO2

Text Books:

1. Handbook of Machine Vision, First Edition, Alexander Hornberg,2006, Wiley VCH.
2. Machine Vision Theory, Algorithms and Practicalities, Davis E.R., 2005, Elsevier.

Reference Books:

1. Understanding and Applying Machine Vision, NelloZuech,,2000,Marcel Decker.
2. Introductory Techniques For 3D Computer Vision, first Edition.,EmanueleTrucco, Alessandro Verri,
3. Digital Image Processing Using MATLAB, Rafael C.Gonzales, Richard.E.Woods, 2014, Mc. Graw Hill Education.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**2.6**	**2.4**	**2**	**2**	**-**	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
(Autonomous)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
III B.Tech II Semester					
	FOUNDATION OF NANO-ELECTRONICS	**3**	**0**	**0**	**3**
SUB CODE: 18OECE322	**(OPEN ELECTIVE-I)**				

Course Educational Objectives:

1: To learn the basic fundamentals of Nano electronics
2: To better understand the of the Nano-micro fabrication.
3:To classify the different Nano materials depending on the properties.
4: To Understand the phenomena using the characterization techniques
5: To provide a foundation for the device fabrication and various applications in the field of sensors technology, optoelectronics, communication and nanotechnology etc.

UNIT-I: Introduction to Tunneling **(9hours)**

Tunnel junction and applications of tunneling, Tunneling Through a Potential Barrier, Metal-Insulator, Metal-Semiconductor, and Metal-Insulator-Metal Junctions, Coulomb Blockade, Tunnel Junctions, Tunnel Junction Excited by a Current Source.

UNIT-II: Tunneling Devices **(9hours)**

Field Emission, Gate—Oxide Tunneling and Hot Electron Effects in nano MOSFETs, Theory of Scanning Tunneling Microscope, Double Barrier Tunneling and the Resonant Tunneling Diode.

UNIT-III: Lithography Techniques **(9hours)**

Introduction to lithography- Contact, proximity printing and Projection Printing, Resolution Enhancement techniques, Positive and negative photo resists, Electron Lithography, Projection Printing. Lithography based on Surface Instabilities: Wetting, De-wetting, Adhesion, Limitations, Resolution and Achievable / line widths, Lift off process, Bulk Micro machining.

UNIT-IV: MEMS Devices **(9hours)**

Introduction to MEMS and NEMS, working principles, micro sensors, micro actuation- thermal actuation, piezoelectric actuation and electrostatic actuation–micro gripers, motors, valves, pumps, accelerometers, fluidics and capillary electrophoresis, active and passive micro fluidic devices, Pizoresistivity, Pizoelectricity and thermoelectricity.

UNIT-V: Nano Electronic Devices **(9hours)**

Scaling of physical systems – Geometric scaling & Electrical system scaling. The Single-Electron Transistor: The Single- Electron Transistor Single-Electron Transistor Logic, Other SET and FET Structures, Carbon Nanotube Transistors (FETs and SETs), Semiconductor Nanowire FETs and SETs, Molecular SETs and Molecular Electronics. Graphenes, fullerenes- Structure and Properties.

TOTAL: 45 HOURS

Course Outcomes:

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

Course Outcomes		POs related to COs
CO1	To understand and analyze the fundamental physics of nano electronics	PO1
CO2	Discuss various Properties of electrons in nanostructures	PO1,PO2
CO3	Describe deep insight to fabrication and characterization techniques in Nanostructures.	PO1,PO2
CO4	Familiarize with concepts of electronics transportation in nanostructures, understanding the working principles of MEMS and NEMS	PO1
CO5	Demonstrate the working of various nano electronics devices	PO1,PO2,PO3

Text Book:

1. Stephen D. Senturia, "Microsystem Design, Springer Verlag", 2001.
2. Marc Madou, "Fundamentals of microfabrication & Nano Technology", Taylor and Francis, 2011.
3. T. Fukada & W.Mens, "Micro Mechanical system Principle & Technology", Elsevier, 1998.
4. Julian W.Gardnes, Vijay K. Varda, "Micro sensors MEMS & Smart Devices", 2001.

Reference Books:

1. Nano Terchnology and Nano Electronics – Materials, devices and measurement Techniques by WR Fahrner – Springer.
2. Nano: The Essentials – Understanding Nano Scinece and Nanotechnology by T.Pradeep; Tata Mc.Graw Hill.
3. Nanoelectronics and Nanosystems – From Transistor to Molecular and Quantum Devices by Karl Goser, Peter Glosekotter, Jan Dienstuhl
4. Quantum-Based Electronic Devices and Systems by M. Dutta and M.A. Stroscio, World Scientific.
5. Micro sensors MEMS& Smart Devices, Julian W.Gardnes, Vijay K. Varda, 2001

CO-PO Mapping

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO *	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
(Autonomous)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
III B.Tech II Semester					
	MEDICAL ELECTRONICS	**3**	**0**	**0**	**3**
SUB CODE: 18OECE323	**(OPEN ELECTIVE-I)**				

Course Educational objectives:

1: To gain knowledge and analyze the various physiological parameters.
2: To understand the respiratory, Blood pressure, temperature measurements etc.
3: To study about the various assist devices used in the hospitals.
4: To gain knowledge about equipment used for various diagnostic and therapeutic techniques.
5: To Know the recent trends in tele medicine and laser in medicine.

Unit I Electro-Physiology and Bio-Potential Recording **(9hours)**

The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG,PCG, lead systems and recording methods, typical waveforms and signal characteristics.

Unit II Bio-Chemical and Non Electrical Parameter Measurement **(9hours)**

PH, PO2, PCO2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, and Blood cell counters.

Unit III Assist Devices **(9hours)**

Cardiac pacemakers, DC Defibrillator, Dialyzer, Heart lung machine

Unit IV Physical Medicine and Biotelemetry **(9hours)**

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radio pill, electrical safety

Unit V Recent Trends in Medical Instrumentation **(9hours)**

Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of this course, the students will be able to		POs related to COs
CO1	Distinguish and analyze the various physiological parameters and its recording methods, signal characteristics.	PO1,PO2
CO2	Describe the respiratory, Blood pressure, temperature measurements etc.	PO1,PO2,PO5
CO3	Analyze function of various assist devices used in the hospitals.	PO1,PO2, PO5
CO4	Demonstrate knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.	PO1,PO2, PO5
CO5	Extend knowledge on recent trends in tele medicine and laser in medicine.	PO1,PO2, PO5

Text Books:

1. Leslie Cromwell, —Biomedical instrumentation and measurement||, Prentice Hall of India, New Delhi, 2007.
2. John G.Webster,‖ Medical Instrumentation Application and Design‖, 3rd Edition, Wiley India Edition, 2007

Reference Books:

1. Khandpur, R.S., —Handbook of Biomedical Instrumentation||, TATA McGraw-Hill, New Delhi, 2003.
2. Joseph J.Carr and John M.Brown, —Introduction to Biomedical equipment Technology||, John Wiley and Sons, New York, 2004.

CO-PO Mapping

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-
CO3	3	3	-	-	2	-	-	-	-	-	-	-
CO4	3	3	-	-	2	-	-	-	-	-	-	-
CO5	3	3	-	-	2	-	-	-	-	-	-	-
CO*	**3**	**3**	**-**	**-**	**2**	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-II SEM (EEE)

L	T	P	C
-	-	2	1

SUB CODE: 18EEE325 POWER ELECTRONICS AND SIMULATION LAB

Course Educational Objectives:
On successful completion of the course, students will be able to

1	Demonstrate knowledge on operation and characteristics of power semiconductor Devices.
2	Design different triggering and commutation circuits for SCR.
3	Analyze physical variations of various power electronic converters
4	Evaluate and compare various parameters from the operation of converters
5	Design and simulate different power electronic circuits using MATLAB

Any 10 of following experiments

Any Eight of the following experiments are required to be conducted as compulsory experiments

1. Study Of Characteristics Of SCR- MOSFET& IGBT
2. Gate Firing Circuits For SCR's
3. Single Phase Ac Voltage Controller with R and RL Loads
4. Single Phase Fully Controlled Bridge Converter with R and RL Loads
5. Forced Commutation Circuits (Class A- Class B - Class C - And Class D & Class E)
6. Dc Jones Chopper With R And RL Loads
7. Single Phase Series Inverter With R And RL Loads
8. Single Phase Parallel- Inverter With R And RL Loads
9. Single Phase Half Controlled Converter With R Load
10. Three Phase Half Controlled Bridge Converter With R-Load

Any four of the following experiments are required to be conducted in addition to above.

11. Single Phase Cyclo converter Controller With R And RL Loads
12. Single Phase Dual Converter Controller With R And RL Loads
13. Pspice Simulation of Single-Phase Half and Full Bridge Inverter Using RLE Loads.
14. Pspice Simulation of Resonant Pulse Commutation Circuit and Buck Chopper
15. Pspice Simulation of Single-Phase Inverter Using RLE Loads.

Course Outcomes:

On successful completion of course, student will be able to

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on operation and characteristics of power Semiconductor devices.	PO1
CO2	Analyze the physical variations of various power electronic converters.	PO2
CO3	Design different triggering and commutation circuits for SCR.	PO3
CO4	Select appropriate design tools and procedure to evaluate performance of various power electronic converters.	PO5
CO5	Follow ethical principles to evaluate performance of AC machines.	PO8
CO6	Do experiments effectively as an individual and as a member in a group.	PO9
CO7	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO8	Continue updating their skill related to electronic devices and their applications during their life time	PO12

Text Books:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.
3. Ashfaq Ahmed 'Power Electronics for Technology', Pearson Education, Indian reprint, 2003.

CO-PO Mapping:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**		**3**			**3**	**3**	**3**		**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH III-II SEM (EEE)

L	T	P	C
-	-	2	1

SUB CODE: 18EEE326 **ELECTRICAL & ELECTRONICS MEASUREMENTS LAB**

Course Educational Objectives:

1. To provide practical experience on procedures for measuring Resistance, Inductance and Capacitance of different ranges
2. To evaluate the three phase power, frequency, core losses.
3. To design experiments for calibration of measuring instruments, LVDT and resistance strain gauge.
4. To determine the resistance, inductance and capacitance parameters using DC and AC brides
5. To know the industrial practices of Measuring earth resistance, dielectric strength of transformer oil & Testing of underground cables

Any 10 of following experiments

Any Eight of the following experiments are required to be conducted as compulsory experiments

1. Calibration And Testing of Single Phase Energy Meter
2. Crompton D.C. Potentiometer – Calibration of PMMC Ammeter And PMMC Voltmeter
3. Kelvin's Double Bridge – Measurement of Resistance – Determination of Tolerance.
4. Measurement of Unknown Inductance Using Anderson's Bridge
5. Measurement of 3 Phases Reactive Power with Single-Phase Wattmeter.
6. Measurement of Parameters of A Choke Coil Using 3 Voltmeter And 3 Ammeter Methods.
7. Calibration LPF Wattmeter – By Phantom Testing
8. Measurement of 3 Phase Power with Two Watt Meter Method (Balanced & Un Balanced).
9. Whetstone's Bridge For Measurement Of Medium Resistance
10. Dielectric Oil Testing Using H.T. Testing Kit

Any two of the following experiments are required to be conducted in addition to above.

11. Measurement of Unknown Capacitance Using Schering Bridge
12. Calibration of Dynamometer Power Factor Meter.
13. Resistance Strain Gauge – Strain Measurements and Calibration.
14. LVDT and Capacitance Pickup – Characteristics and Calibration.
15. Testing of Numerical Relay.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes:

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

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on procedures for measuring Resistance, Inductance and Capacitance of different ranges.	PO1
CO2	Analyze and evaluate the three phase power, frequency, core losses	PO2
CO3	Design and calibrate of various measuring instruments	PO3
CO4	Determine the resistance, inductance and capacitance parameters using DC and AC brides	PO4
CO5	Follow ethical principles to evaluate performance of AC machines.	PO8
CO6	Do experiments effectively as an individual and as a member in a group.	PO9
CO7	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO8	Continue updating their skill related to electronic devices and their applications during their life time	PO12

Text Books:

1. Electrical& Electronic Measurement &Instruments – 18/e –2010 A.K.SawhneyDhanpatRai& Co. Publications – New Delhi.
2. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications.
3. Lab manual provided by the department.

CO-PO Mapping:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**		**3**	**3**			**3**	**3**	**3**		**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

18EEE327 **PROJECT SKILLS LAB**

Course Educational Objectives:

1. Objective is to give an opportunity to the student to get hands on training in design and innovation.
2. Comparing and contrast the several existing solutions for the problem identified.
3. Formulating and propose a plan for creating a solution for the research plan identified.
4. Conducting the experiments as a team and interpret the results.
5. Reporting and presenting the findings of the work conducted.

The aim of the project skill lab is to deepen comprehension of principles by applying them to a new problem which may be the device / system / component / working mode to be created / fabricated may be decided in consultation with the supervisor and if possible with an industry. A project topic must be selected by the students in consultation with their supervisor. The students may be grouped into 3 to 5 and work under a project supervisor.

A project report to be submitted by the group and along with the model / system, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination the project work is evaluated based on oral presentation and the project report along with device / system / component / working model jointly by external and internal examiners constituted by the Head of the Department.

Course Outcomes:

On successful completion of course, the student will be able to		**POs related to COs**
CO1	Demonstrate in-depth knowledge on the project topic	**PO1**
CO2	Identify, analyze and formulate complex problem chosen for project work to attain substantiated conclusions.	**PO2**
CO3	Design solutions to the chosen project problem.	**PO3**
CO4	Undertake investigation of project problem to provide valid conclusions	**PO4**
CO5	Use the appropriate techniques, resources and modern engineering tools necessary for project work	**PO5**
CO6	Apply project results for sustainable development of the society.	**PO6**
CO7	Understand the impact of project results in the context of environmental sustainability.	**PO7**
CO8	Understand professional and ethical responsibilities while executing the project work.	**PO8**
CO9	Function effectively as individual and a member in the project team	**PO9**
CO10	Develop communication skills, both oral and written for preparing and presenting project report.	**PO10**
CO11	Demonstrate knowledge and understanding of cost and time analysis required for carrying out the project.	**PO11**
CO12	Engage in lifelong learning to improve knowledge and competence in the chosen area of the project.	**PO12**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Manual: Refer project work manual for evaluation

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	-
CO7	-	-	-	-	-	-	3	-	-	-	-	-
CO8	-	-	-	-	-	-	-	3	-	-	-	-
CO9	-	-	-	-	-	-	-	-	3	-	-	-
CO10	-	-	-	-	-	-	-	-	-	3	-	-
CO11	-	-	-	-	-	-	-	-	-	-	3	-
CO12	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE411 POWER SYSTEM OPERATION AND CONTROL

Course Educational Objectives:
On successful completion of the course, students will be able to

1 To understand optimal dispatch of generation with and without losses.
2 To study the optimal scheduling of hydro thermal systems.
3 To study the optimal unit commitment problem.
4 To study the load frequency control for single and Two area system with and without controller.
5 To understand the reactive power control and compensation of transmission lines

Unit I: Economic Operation of Power Systems (9hour)

Optimal operation of Generators in Thermal Power Stations - - heat rate Curve – Cost Curve – Incremental fuel and Production costs - input-output characteristics - Optimum generation allocation with line losses neglected. Optimum generation allocation including the effect of transmission line losses – Loss Coefficients

Unit II: Hydrothermal scheduling (7 hours)
Optimal scheduling of Hydrothermal System: Hydroelectric power plant models - Scheduling problems-Short term hydrothermal scheduling problem.

UNIT III: Modeling of Turbine – Governor (9hours)
Modeling of Turbine: First order Turbine model - Block Diagram representation of Steam Turbines and Approximate Linear Models. Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of small signal transfer function – Block Diagram.

Unit IV: Load Frequency Control (9hours)

Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Load frequency control of 2-area system – uncontrolled case and controlled case - tie-line bias control. Proportional plus Integral control of single area and its block diagram representation - steady state response – Load Frequency Control and Economic dispatch control.

Unit V: Reactive Power Control & Power System restructuring (10hours)
Overview of Reactive Power control – Reactive Power compensation in transmission systems – advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator - Uncompensated and compensated transmission lines: shunt and Series Compensation. Introduction-Need for regulation-Motivation for power system restructuring - key issues in deregulation.

TOTAL: 45 Hours

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Compute optimal scheduling of Generators.	PO1,PO2
CO2	Understand hydrothermal scheduling.	PO1,PO2
CO3	Understand the unit commitment problem.	PO1,PO2
CO4	Understand the load frequency controllers in single area and two area systems	PO1,PO2
CO5	Understand reactive power control and compensation for transmission line.	PO1,PO2

Text Books:

1. Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata M Graw – Hill Publishing Company Ltd - 2nd edition.
2. Power System Analysis Operation and Control – A. Chakravarthi
3. and S. Halder, 3rd Edition, PHI.
4. Electric Energy Systems by O I Elgerd - Mc Graw-hill Edition.

Reference Books:

1. Power System Analysis and Designby J.Duncan Glover and M.S.Sarma. - THOMPSON - 3rd Edition.
2. Electric Power Generation, Transmission and Distribution by S. N.Singh, 2nd Edition, PHI.
3. Electric Power Systems by S. A. Nasar, Schaum's Outline Series,Revised 1st Edition, TMH.

CO-PO Mapping:

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO*	**2.8**	**2.6**										

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE412 **SPECIAL ELECTRICAL MACHINES**

Course Educational Objectives:
On successful completion of the course, students will be able to

1	Demonstrate knowledge on construction and performance of synchronous reluctance motors
2	Offer knowledge on construction and operation, drive system and circuit control and their modes of operation of stepper motor.
3	Provide knowledge on drive system and circuit control of switched reluctance motor.
4	Afford knowledge on construction and performance of PMBLDC motor.
5	Supply knowledge on construction and performance of permanent magnet synchronous motor and their characteristics

Unit I: Synchronous Reluctance Motors **(9 hours)**

Constructional features – Types – Axial and Radial flux motors – Operating principles – Variable Reluctance Motors – Voltage and Torque Equations - Phasor diagram - performance characteristics –Applications.

Unit II: Stepper Motors **(9 hours)**

Constructional features; principle of operation–Variable Reluctance motor-Hybrid motor-Single stack and multi stack configurations- Modes of operation – Drive circuits –Static and Dynamic Characteristics and Applications.

Unit III: Switched Reluctance Motors **(9hours)**

Constructional details - principles of operation - Torque production– drive circuits – Current control schemes– Torque speed characteristics – Closed loop and sensor less control of SRM drive –Methods of rotor position sensing – Applications.

Unit IV: Permanent Magnet Brush Less Dc Motors **(9hours)**
hours

Comparison between mechanical and electronic commutators – Principle of operation - drive circuits – Torque and EMF equation – Torque and Speed characteristics –sensor less control of B LDC motors–applications.

Unit V: Permanent Magnet Synchronous Motors **(9 hours)**

Principles of operation – Constructional features – Phasor diagram – torque speed characteristics – torque and EMF equations –power controllers - applications. Linear Synchronous Motor (LSM): Construction, types, principle of operation, thrust equation, control and applications. **TOTAL: 45 Hours**

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on construction and performance of synchronous reluctance motors	PO1,PO2,PO3,PO12
CO2	Acquire knowledge on the modes of operation, drive system and circuit control of stepper motor.	PO1,PO2,PO3,PO12
CO3	Able to analyze and understand construction and principle of operation of switched reluctance motor.	PO1,PO2,PO12
CO4	Able to analyze and understand drive system and circuit control of PMBLDC motor.	PO1,PO2,PO3,PO12
CO5	Able to analyze and understand the performance of permanent magnet synchronous motor.	PO1,PO2,PO12

Text Books

1. Venkataratnam K- "Special Electrical Machines" - Universities Press - Hyderabad - 2008.
2. P.P.Acarnley-"Stepping Motors -A Guide to Modern theory and practice" - PeterPeregrines - London - 2002.
3. Dr.P.S.Bhimbra-"Generalized theory of Electrical machines"-Khanna Publishers
4. Sen.P.C."Principles of Electrical Machines and Power Electronics", John willey & sons, Second Edition,2008

Reference Books

1. J.Gnanavadivel ,Dr.S.Muralidharan-"Principles of Special Electrical Machines" –Anuradha Publications-Chennai.
2. T.J.E. Miller-"Brush less Permanent Magnet and reluctance Motor Drives" - ClarendonPress - Oxford - 1989.
3. Say. M.G" Alternating current machines" John willey & sons, fifth edition 1983

CO-PO Mapping:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	2
CO3	3	3	-	-	-	-	-	-	-	-	-	2
CO4	3	3	2	-	-	-	-	-	-	-	-	2
CO5	3	3	-	-	-	-	-	-	-	-	-	2
CO*	**3**	**3**	**2**									**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18ECE418 **MICROPROCESSORS AND INTERFACING**

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Demonstrate knowledge on the architecture of 8086 Microprocessor
2 Apply the skill on various 8086 Instruction set and Assembler Directives.
3 Study the different interfacing methods to 8086 Microprocessor
4 Understand programmable peripheral devices and their Interfacing
5 Develop application skills on different programming techniques of 8086 Microprocessor

Unit I: Introduction to 8085 Microprocessor **(9 hours)**

Architecture of 8085 Microprocessor- The 8085 Programming Model- Pin diagram of 8085- Machine Cycle Status and Control Signals- Addressing Modes- Instruction Classification- Instruction Format- Simple Programs Involving Logical- Branch and Call Instructions.

UNIT II: Introduction to 8086 Microprocessor **(9 hours)**

Architecture of 8086 Microprocessor- Special functions of General Purpose register- 8086 flag register and function of 8086 Flags- Addressing modes of 8086- Instruction set of8086- Assembler directives- simple programs- procedures- and macros

Unit III: Assembly Language Programming & Timing Diagrams **(9 hours)**

Assembly Language Programs Involving Logical- Branch & Call Instructions- Sorting- Evaluation Of Arithmetic expressions- String Manipulation- Pin Diagram Of 8086- Minimum Mode And Maximum Mode Of Operation- Timing Diagram- Memory interfacing To 8086 (Static RAM&EPROM)- Need For DMA- Interfacing With8237/8257.

Unit IV: Programmable Interfacing Devices & Interrupt Structure **(9 hours)**

8255 PPI – Various Modes Of Operation And Interfacing To 8086- Interfacing Keyboard- Displays- 8279- Stepper Motor - D/A And A/D Converter Interfacing, Interrupt Structure Of 8086- Vector Interrupt Table- Interrupt Service Routines- Introduction to Dos and Bios interrupts- 8259 PIC Architecture And Interfacing and its importance.

Unit V: Serial Data Transfer Schemes **(9 hours)**

Serial data transfer schemes- Asynchronous and Synchronous data transfer schemes- 8251 USART architecture and interfacing- TTL to RS 232C and RS232C to TTL conversion- Sample program of serial data transfer- Introduction to High-speed serial communications standards- USB-features of advanced microprocessors(80286,80386, Pentium)-features of 8051 microcontroller.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on the architecture of 8086 Microprocessor.	PO1
CO2	Apply the skill on various 8086 Instruction set and Assembler Directives	PO1
CO3	Study the different interfacing methods to 8086 Microprocessor	PO1
CO4	Understand programmable peripheral devices and their Interfacing	PO1, PO2
CO5	Develop application skills on different programming techniques of 8086 Microprocessor	PO1, PO2, PO3

Text Books:

1. Advanced microprocessor and Peripherals, 2 nd edition, 2000, A, K, Ray and K, M, Bhurchandi, TMH, New Delhi.
2. Microprocessor architecture, programming and applications with 8085/8080A 2nd edition,1996, Ramesh S,Goankar, New age international Publishers, New Delhi.

References:

1. Micro Processors &Interfacing, revised 2nd edition,2007, Douglas U, Hall ,TMH, New Delhi.
2. The 8088 and 8086 microprocessors, 1st edition,2003, Walter A, Triebel, Avtar Singh, PHI, New Delhi.
3. Micro Computer System 8086/8088 Family Architecture, Programming and Design, 2nd Ed, 2000, By Liu and GA Gibson, PHI, New Delhi.
4. The X8086 microprocessor architecture, programming and interfacing, 1st edition, 2010, l, das, pearson education India limited, New Delhi.
5. The 8086 microprocessor programming and interfacing, 1/e, 2007, Kenneth J,Ayala, Cenange learning private limited, New Delhi.

CO-PO Mapping:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	3	-	-	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**	**3**								

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

CORE ELECTIVE -I

B.TECH IV-I SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE413A **POWER QUALITY**

Course Educational Objectives:
On successful completion of the course, students will be able to

1. Know the fundamental of electric power quality phenomena
2. Learn the Voltage Sags and Interruptions
3. Know the detailed analysis of Transient and over voltages
4. Learn about Harmonics fundamentals
5. Learn the power quality Benchmarking process.

Unit- I: Introduction **(9 hours)**

What is power quality? Power quality – voltage quality - why are we concerned about power quality? - the power quality Evaluation procedure - Terms and Definitions - Transients - Long-duration voltage variations - short-voltage variations - voltage imbalance - wave form distortion - voltage fluctuation - power frequency variations - power quality terms CBEMA and ITI curves.

Unit -II: Voltage Sags and Interruptions **(9 hours)**

Sources of sags and interruptions - Estimating voltage sag performance - fundamental principles of protection - solutions at the end-use level - Motor-starting sags - utility system fault-clearing issues.

Unit -III: Transient over Voltages **(9 hours)**

Sources of over voltages - principles of over voltage protection - devices for over voltage protection - utility capacitor-switching transients - utility system lightning protection.

Unit -IV: Fundamentals of Harmonics & Applied Harmonics **(9 hours)**

Harmonic Distortion - Voltage versus current distortion - Harmonics versus Transients - power system qualities under non sinusoidal conditions - Harmonic indices - Harmonic sources from commercial loads - Harmonic sources from Industrial loads Effects of Harmonics - Harmonic distortion evaluations - Principles of Controlling Harmonics - Devices for Controlling Harmonic Distortion

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

Unit -V: Power Quality Bench Marking and Monitoring (9 hours)

Benchmarking process, RMS voltage variation indices Power Quality Contracts. Monitoring considerations-Power quality measurement equipment, assessment of power quality measurement data, application of intelligent systems, - Power quality Monitoring standards.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Understand voltage sag, swell, long and short duration voltage variations.	PO1,PO2,PO4,PO12
CO2	Understand the sources, principle of protection of voltage sag and interruption.	PO1,PO2,PO3,PO4,P O12
CO3	Understand the concept of capacitor switching and lightning.	PO1,PO2,PO4,PO12
CO4	Understand the controlling of harmonic distortion.	PO1,PO2,PO3,PO4, PO12
CO5	Understand various power qualities monitoring equipment and benchmarking process.	PO1,PO3,PO4,PO12

Text Books:

1. Electrical Power Systems Quality - Roger C. Dugan - Mark F. McGranaghan - Surya SantosH.Wayne Beaty - 2nd Edition - TMH Education Pvt. Ptd.

Reference Books:

1. Electrical systems quality Assessment by J. Arrillaga - N.R. Watson - S. Chen - John Wiley& Sons
2. Understanding Power quality problems by Math H. J. Bollen IEEE Press.

CO-PO Mapping:

CO -PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	-	3	-	-	-	-	-	-	-	3
CO2	2	2	3	3	-	-	-	-	-	-	-	3
CO3	2	2	-	3	-	-	-	-	-	-	-	3
CO4	2	2	3	3	-	-	-	-	-	-	-	3
CO5	2	-	3	3	-	-	-	-	-	-	-	3
CO*	2	2	3	3								3

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CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE413B HVDC TRANSMISSION SYSTEMS

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Understand the concept of DC power transmission and comparison with AC Power transmission.
2 Analyze HVDC converters.
3 Study about the Converter Control and HVDC system control.
4 Understand the significance of reactive power control and design of filters.
5 Study about DC system model.

Unit -I: Introduction (9 hours)

DC Power transmission technology – Comparison of AC and DC transmission – Application of DC transmission – Description of DC transmission system – Planning for HVDC transmission – Modern trends in HVDC technology – DC breakers – Operating problems – HVDC transmission based on VSC – Types and applications of MTDC systems.

Unit -II: Analysis of HVDC Converters (9 hours)

Line commutated converter - Analysis of Graetz circuit with and without overlap - Pulse number – Choice of converter configuration – Converter bridge characteristics – Analysis of a 12 pulse Converters – Analysis of VSC topologies and firing schemes.

Unit -III: Converter and HVDC System Control (9 hours)

Principles of DC link control – Converter control characteristics – System control hierarchy – Firing angle control – Current and extinction angle control – Starting and stopping of DC link – Power control – Higher level controllers – Control of VSC based HVDC link.

Unit -IV: Reactive Power and Harmonics Control (9 hours)

Reactive power requirements in steady state – Sources of reactive power – SVC and STATCOM – Generation of harmonics – Design of AC and DC filters – Active filters.

Unit -V: Power Flow Analysis in AC/DC Systems (9 hours)

Over View of Power flows analysis – DC system model –Solution Procedure- Inclusion of constraints – case study.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Acquire knowledge on AC and DC Transmission System and Modern Trends in HVDC systems	PO1,PO2,PO3,PO12
CO2	Able Know the operation of converters	PO1,PO2,PO3
CO3	To understand the concepts Converter Control and HVDC system control	PO1,PO3,PO4
CO4	Acquire Knowledge on concept of reactive power control and Design of Filters	PO1,PO3,PO4
CO5	Able to Understand the Power flows analysis in AC/DC System	PO1,PO3,PO4,PO12

Text Books:

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited, and Publishers.
2. HVDC Transmission By S.Kamakshaiah Andv.Kamaraju-Tata Mcgraw–Hill

Reference Books:

1. HVDC Transmission – J.Arrillaga.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	1
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	-	3	3	-	-	-	-	-	-	-	-
CO4	3	-	3	3	-	-	-	-	-	-	-	-
CO5	2	-	3	3	-	-	-	-	-	-	-	2
CO*	**2.8**	**2.5**	**2.6**	**3**								**1.5**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE413C DIGITAL CONTROL SYSTEMS

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Provide the knowledge on sampling and reconstruction.
2 Offer the knowledge on Discrete time control and state space analysis
3 Afford the knowledge on controllability and observability.
4 Offer knowledge on design of state feedback controllers and observers.
5 Provide the knowledge on stability analysis.

Unit -I: Sampling and Reconstruction & Z-Transforms (9 hours)

Introduction - Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion - sample and hold operations. Linear difference equations - pulse response - Z – transforms - Theorems of Z – Transforms - the inverse Z – transforms - Modified Z- Transforms - Z-Transform method for solving difference equations.

Unit -II: State Space Analysis of Discrete Time Control System (9 hours)

Pulse transforms function - block diagram analysis of sampled – data systems - mapping betweens-plane and z-plane. State Space Representation of discrete time systems - Pulse Transfer Function Matrix solving discrete time state space equations - State transition matrix and its Properties - Methods for Computation of State Transition Matrix - Discretization of continuous time state space equations.

Unit -III: Controllability and Observability (9 hours)

Concepts of Controllability and Observability - Tests for controllability and Observability. Duality between Controllability and Observability - Controllability and Observability conditions for Pulse Transfer function.

Unit -IV: State Feedback Controllers and Observers (9 hours)
Design of state feedback controller through pole placement – Necessary and sufficient conditions - Ackerman's formula. State Observers – Full order and Reduced order observers.

Unit -V: Stability Analysis (9 hours)
Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci - Constant damping ratio loci - Stability Analysis of closed loop systems in the Z-Plane. Jury and stability test – Stability Analysis by use of the Bilinear Transformation and Routh stability criterion.

TOTAL: 45 Hours

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

Course Outcomes

On successful completion of the course, students will be able to		POs related to COs
CO1	Able to analyze sampling and reconstruction.	PO1,PO2,PO3,PO12
CO2	Able to analyze Discrete time control and state space analysis.	PO1,PO2,PO3,PO12
CO3	Able to identify controllability and observability of systems.	PO1,PO2
CO4	Able to design state feedback controllers and observers.	PO1,PO2,PO3,PO4,PO12
CO5	Able to evaluate stability of different systems.	PO1,PO3,PO4

Textbooks:

1. Discrete-Time Control systems - K. Ogata - Pearson Education/PHI - 2nd Edition
2. Digital Control and State Variable Methods by M.Gopal – TMH

Reference books:

1. Digital Control Systems - Kuo - Oxford University Press - 2nd Editions - 2003.
2. Richard C. Dorf and Robert H. Bishop, Modern Control Systems, Prentice Hall, 12th edition, 2010.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	2
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	2
CO5	3	-	2	2	-	-	-	-	-	-	-	-
CO*	**3**	**2.75**	**2**	**2**								**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE413D POWER SYSTEMS ECONOMICS

Course Educational Objectives:

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

1 Understand the importance of cost, PF improvement, size of generating units and Tariff.
2 Acquire knowledge on economic load dispatch problems.
3 Understand Artificial Intelligence Techniques for solving ELD problems.
4 Afford knowledge on interconnected systems
5 Provide knowledge on optimal power flow problem

Unit -I: Economic Considerations (9 hours)

Cost of electrical energy - Expressions for cost of electrical energy – Capital-interest – Depreciation - Different methods - Factors affecting cost of operation - Number and size of generating units - Importance of high load factor - Importance of power factor improvement - Most economical power factor - Meeting the KW demand on power stations – Power system tariffs – Regions and structure of Indian Power System.

Unit -II: Economic Dispatch (9 hours)

Modeling of Cost Rate Curves – Economic Dispatch Calculation - Losses neglected - with generator Real and Reactive power limits; Losses included - Losses of economy in incremental cost data - Problems - Generator Capability Curve – Effect of Ramping rates – Prohibited Operating Zones - Automatic Load dispatch in Power Systems.

Unit -III: Economic Operation (9 hours)

General loss formula - Evolution of incremental transmission loss rate - Method of calculation of loss coefficients – Systematic development of transmission loss formula - Transmission loss as a function of plant generation – Participation Factor - Non – Smooth Fuel Functions (Quadratic - Valve point loading - CCCP - Multiple Fuel) – Problems - Introduction to Artificial Intelligence Techniques for solving ELD problems.

Unit -IV: Interconnected Systems (9 hours)

Interconnected operation - Economic operation of hydro thermal power plants – Iteration scheme - Gradient approach – Newton's method - Modeling and solution approach to short term and long term Hydro-Thermal scheduling problem using Dynamic Programming.

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CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

Unit -V Optimal Power Flow and Fundamentals of Markets (9 hours)

Problem formulation - Cost minimization - Loss minimization - Solution using NLP and successive LP methods – Constraints - DC and AC OPF (Real and Reactive Power Dispatch) – Effect of Contingencies - Voltage and Phase angle - Transient Voltage Dip/Sag Criteria. Fundamentals of Markets – Introduction to Efficiency and Equilibrium - Modeling of consumers and producers – Single and Double Auction mechanism - Global welfare – Dead Loss – Spot and Forward Markets.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	To understand the importance of cost, PF improvement, size of generating units and Tariff.	PO1,PO2,PO3,PO4, PO12
CO2	To acquire knowledge on economic load dispatch problems.	PO1,PO2,PO3,PO4, PO12
CO3	To understand Artificial Intelligence Techniques for solving ELD problems.	PO1,PO2
CO4	To afford knowledge on interconnected systems	PO1,PO2,PO3,PO4
CO5	To provide knowledge on optimal power flow problem	PO1,PO2,PO3,PO4

Text Books:

1. Allen J Wood and B F Wollenberg- "Power Generation - Operation and Control" - John Wiley & Sons - New York - 2004.
2. Power System Economics- Designing Markets for Electricity, 2003, by Steven Stoft, Wiley- Interscience, USA.

Reference Books:

1. Kirchmayer. L.K - "Economic operation of power system" - John Wiley & Sons - 1953.
2. Fundamentals of Power System Economics, 2 e/d, 2010, by Daniel S Kirschen, John Wiley & Sons, New Jersy.
3. Market Operations in Electric Power Systems: Forecasting, Scheduling, and Risk Management,1st e/d, 2002, by M. Shahidehpour, John Wiley & Sons, NewYork.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	3
CO2	3	2	2	2	-	-	-	-	-	-	-	3
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**	**2**								**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-I SEM(EEE)

L	T	P	C
3	0	0	3

SUB CODE:18EEE413E POWER SYSTEM DYNAMICS

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Introduce the basics of dynamics and stability problems.
2 Educate on modeling of synchronous machines.
3 Educate on the excitation system and speed-governing controllers.
4 Study small signal stability of a single machine infinite bus system with excitation system and power system stabilizer.
5 Educate on the transient stability simulation of multi machine power system.

Unit -I: Basic Concepts (9 hours)

Power system stability- states of operation and system security - system dynamics – problems - system model – analysis of steady state stability and transient stability – simplified representation of excitation control.

Unit -II: Modeling of Synchronous Machine (9 hours)

Synchronous machine – Park's transformation – analysis of steady state performance – per unit quantities- Equivalent circuits of synchronous machine – Determination of parameters of equivalent circuits.

Unit -III: Excitation System (9 hours)

Excitation system modeling – block diagram – system representation by state equations – dynamics of a synchronous generator connected to infinite bus – system model – Synchronous machine model – stator and rotor equations – Synchronous machine model with field circuit.

Unit -IV: Analysis of Single Machine System (9 hours)

Small signal analysis with block diagram – Representation characteristic equation and application of Routh Hurwitz criterion - synchronizing and damping torque analysis – small signal model – State equations.

Unit -V: Application of Power System Stabilizers (9 hours)

Basic concepts in applying PSS – Control signals – Structure and tuning of PSS – Washout

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on fundamental dynamic behavior of power systems	PO1,PO2,PO3
CO2	Acquire knowledge on synchronous machine modeling	PO1,PO3
CO3	Demonstrate knowledge on excitation system modeling	PO1,PO3
CO4	Acquire knowledge on analyzing single machine system	PO1,PO2,PO3
CO5	Demonstrate knowledge on application of power system stabilizers	PO1,PO2

Text Books:

1. K R Padiyar, "Power Systems Dynamics", B.S. publications.
2. P M Anderson and A A Fouad, "Power system control and stability", IEEE Press

Reference Books:

1. R Ramanujam, "Power Systems Dynamics", PHI publications.
2. P Kundur, "Power system stability and control", McGraw Hill publishers.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2.5**									

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE413F GAS INSULATED SYSTEMS ANDSUBSTATIONS

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Learn about SF6 gas properties and application in electrical apparatus.
2 Study about Layout of GIS stations.
3 Provide knowledge on Design and Construction of GIS Stations
4 Study about Testing of GIS
5 Analyze about GIS Diagnostics and Fast Transient Phenomena in GIS

UNIT -I: Introduction to GIS and Properties of SF6: (9 hours)

Characteristics of GIS, Introduction to SF6, Physical Properties, Chemical Properties, Electrical Properties, Specifications of SF6 Gas for GIS Applications, Handling of SF6 Gas Before Use, Safe Handling of SF6 Gas in Electrical Equipment, Equipment for Handling the SF6 Gas, SF6 and Environment.

UNIT -II: Layout of GIS Stations (9 hours)

Advantages of GIS Stations, Comparison With Air Insulated Substations, Economics of GIS,User Requirements for GIS,Main Features of a GIS,General Arrangement of a GIS,Planning and Installation, Components of a GIS station.

Unit -III: Design and Construction of GIS Stations (9 hours)

Introduction, Ratings of GIS Components, Design Features ,Estimation of Different types of Electrical Stresses, Design Aspects of GIS Components, Insulation Design for GIS, Thermal Considerations in the Design of GIS, Effect of Very Fast Transient over voltages(VFTO)on the GIS Design, Insulation Coordination in GIS ,GIS Grounding Systems, Gas handling and Monitoring System Design.

Unit -IV: Testing of GIS (9 hours)

Introduction, Various Tests on GIS, Design Approach for Manufacturing and Type Tests, Quality assurance in Manufacturing, Shipping and Erection, On-Site Testing of GIS, Dielectric Tests, commonly used On-site Test Methods, Experience during On-Site Testing, Condition Monitoring and Diagnostic Methods.

UNIT -V: GIS Diagnostics and Fast Transient Phenomena in GIS (9 hours)

Introduction, Characteristics of imperfections in Insulation, Insulation Diagnostic Methods, PD Measurement, UHF Method, Disconnector Switching in Relation to Very Fast Transients, Origin of VFTO, Propagation and Mechanism of VFTO,VFTO Characteristics, Effect of VFTO, Testing of GIS for VFTO.

TOTAL:45Hours

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Acquire knowledge on GIS and SF6 gas	PO1,PO3
CO2	Analyze Layout of GIS Stations	PO1,PO3,
CO3	Understand the concepts Design and Construction of GIS Stations	PO1,PO3
CO4	Acquire knowledge on Various Tests on GIS	PO1,PO3
CO5	Identify GIS Diagnostics and Fast Transient Phenomena in GIS	PO1,PO3,PO12

Text Book:

1. M.S.Naidu,"Gas Insulated Substations" I.K International publishing house Pvt.Ltd, New Delhi.

Reference Books:

1. O.Kindsen&K.V.Menon, " Future developments trend in GIS Technology" 3rdworkshop & conference on EHV Technology, Indian Institute of Science, Bangalore, August 2-4, 1995.
2. V.N.Maller and M.S.Naidu "Advances in High Voltage Insulation & Arc Interruption in SF6 and Vaccum", Pergamon Press, Oxford, 1982.

CO-PO Mapping:

CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	2	-	-	-	-	-	-	-	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-
CO4	3	-	2	-	-	-	-	-	-	-	-	-
CO5	3	-	2	-	-	-	-	-	-	-	-	2
CO*	**3**		**2**									**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

CORE ELECTIVE -II

B.TECH IV-I SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE414A NONCONVENTIONAL ENERGY SOURCES

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Demonstrate knowledge on solar energy plants
2 Study various Wind Energy Conversion System and location of site selection for Wind Energy Conversion System
3 Evaluate the economic aspects and operation of Bio mass Energy systems.
4 Estimate potential and conversion techniques of Geothermal energy systems
5 Estimate potential and conversion techniques of Tidal energy and wave energy system.

Unit -I: Solar Radiation and its Measurements (9 hours)

Introduction, solar constant ,solar radiation at the earth surface, solar radiation geometry, solar radiation measurements, solar radiation data, estimation of average solar radiation, solar radiation on titled surface, solar applications: solar thermal electric conversion, solar electric power generation

Unit -II: Wind Energy (9 hours)

Basic principles of wind energy conversion, Site Selection Considerations, Basic Components of a Wind Energy Conversion System, Schemes for Electric Generation using Synchronous Generator and Induction Generator, ,Wind energy Storage

Unit -III: Bio Mass Energy (9 hours)

Bio-mass Principles of Bio-Conversion Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C .Engine operation and economic aspects

Unit -IV: Geothermal Energy (9 hours)

Introduction, geothermal sources: hydro thermal convective resources,geo pressurized resources hot dry rock resources, magma resources ,potential in India.

OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

Unit -V: Tidal Energy **(9 hours)**

Introduction ,basic principles of tidal power ,components of tidal power plant, operation methods of utilization of tidal energy ,estimation of energy and power in a single basin and double basin tidal system. **Wave Energy**: Energy and power from the wave, wave energy conversion devices, mini-hydel power plants, and their economics.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Demonstrate knowledge on solar energy plants	PO1,PO2,PO3,PO12
CO2	Study various Wind Energy Conversion System	PO1,PO2,PO3,PO12
CO3	Evaluate the economic aspects and operation of Bio mass Energy	PO1,PO2,PO3,PO12
	systems	
CO4	Estimate potential and conversion techniques of Geothermal energy and ocean energy systems	PO1,PO2,PO3,PO12
CO5	Estimate potential and conversion techniques of Tidal energy and wave energy systems	PO1,PO2,PO3,PO12

Text Books:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers
2. Renewable Energy Resources – Twidell & Wier, CRC Press(Taylor & Francis)

Reference Books:

1. Renewable energy resources by Tiwari and Ghosal, Narosa.
2. Renewable Energy Technologies by Ramesh & Kumar, Narosa.
3. Non-Conventional Energy Systems by K Mittal, Wheeler
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, PHI.

CO-PO Mapping:

CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	2
CO3	3	3	2	-	-	-	-	-	-	-	-	2
CO4	3	3	2	-	-	-	-	-	-	-	-	2
CO5	3	3	2	-	-	-	-	-	-	-	-	2
CO*	3	3	2									2

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE414B POWER SYSTEM DYNAMICS AND CONTROL

Course Educational Objectives:
On successful completion of the course, students will be able to

1. Study detailed modeling of synchronous machine and its excitation and speed-governing controllers.
2. Study modeling of synchronous machine using Park's transformation.
3. Educate on the excitation system and speed-governing controllers.
4. Study small signal stability of a single machine infinite bus system with excitation system and power system stabilizer.
5. Educate on the transient stability and dynamic stability of multi machine power system.

Unit -I: Introduction (9 hours)

Concept and importance of stability in power system operation and design - distinction between transient and dynamic stability - complexity of stability problem in large system: Need for reduced models - stability of interconnected systems.

Unit -II: Machine Modeling (9 hours)

Park's transformation - flux linkage equations - current space model - per unit conversion, normalizing the equations - equivalent circuit - flux linkage state space model - sub transient and transient inductances and time constants. Simplified models (one axis and constant flux linkage) - steady state equations and phasor diagrams.

Unit -III: Machine Controllers (9 hours)

Exciter and voltage regulators - function of excitation systems - types of excitation systems - typical excitation system configuration - block diagram and state space representation of IEEE type 1 excitation system - saturation function - stabilizing circuit. Function of speed governing systems - block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

Unit -IV: Transient Stability Analysis (9 hours)

State equation for multi machine simulation with one axis model - transient stability simulation of multi machine power system with one axis machine model including excitation system and speed governing system using R-K method of fourth order (Gill's technique) - power system stabilizer.

Unit -V: Dynamic Stability Analysis (9 hours)

System response to small disturbances - Linear model of the unregulated synchronous machine and its modes of oscillation, regulated synchronous machine - distribution of power impact,

linearization of the load equation for the one machine problem - Simplified linear model, effect of excitation on dynamic stability - approximate system representation - supplementary stabilizing signals, dynamic performance measure, small signal performance measures.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on fundamental dynamic behavior of power systems	PO1,PO2,PO3
CO2	Acquire knowledge on synchronous machine modeling and function of speed governor	PO1,PO3
CO3	Demonstrate knowledge on excitation system modeling	PO1,PO3
CO4	Acquire knowledge on analyzing transient stability	PO1,PO2,PO3
CO5	Demonstrate knowledge on application of small signal stability for dynamic stability analysis	PO1,PO2

Text Books:

1. K R Padiyar, "Power Systems Dynamics", B.S. publications.
2. P M Anderson and A A Fouad, "Power system control and stability", IEEE Press

Reference Books:

1. R Ramanujam, "Power Systems Dynamics", PHI publications.
2. P Kundur, "Power system stability and control", McGraw Hill publishers.
3. P W Sauer & M A Pai, "Power system Dynamics and Stability", Pearson, 2003.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2.5**									

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-I SEM(EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE414C RENEWABLE POWER GENERATION AND CONTROL

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Make the student know various methods of Renewable Energy Systems
2 Train the students to design the PV-Cells.
3 Make the student know the wind energy system
4 Make the student understand the concept of fuel cell
5 Make the student know the applications of fuel cell

Unit -I: Introduction (9 hours)

Introduction to Renewable Energy Systems: Wind power, Hydropower, Solar energy-Biomass, Bio-fuel, Geothermal Heat energy, Solar-thermal plants, Applications.

Unit -II: PV-Cells and Applications (9 hours)

Introduction to PV-Cells, Array, Solar power extraction using PV-Cells, I-V Characteristics, PV-Inverters without D.C. to D.C. converters, Grid interfacing-with isolation, without isolation, Maximum power point tracking-Methods, PV-Inverters with D.C. to D.C. converters-on low frequency side and high frequency side with isolation, without isolation.

Unit -III: Wind Energy System (9 hours)

Wind Energy Sources and potentials, Evaluation of Wind Intensity, Topography, General Classification of Wind Turbines-Rotor Turbines, Multiple-Blade Turbines, Drag Turbines, Lifting Turbines, System TARP–WARP, Generators and speed control used in wind power energy, Wind Power Control: Fixed speed with capacitor bank, Rotor resistance control, DFIG, Synchronous Generator-external magnetized, Synchronous Generator-permanent magnets.

Unit -IV: Introduction to Fuel Cells (9 hours)

Fuel cells, Commercial Technologies for Generation of Electricity, Constructional Features of Solid Oxide Fuel Cells, Constructional Features of Proton Exchange Membrane Fuel Cells, Load Curve Peak Sharing with Fuel Cells.

Unit -V: Fuel Cells and Application **(9 hours)**

Advantages and Disadvantages of Fuel Cells, voltage step-up using D.C.-D.C. converter- with and without battery storage, Voltage controller for Fuel cell using D.C. – D.C. converter,

Inverter interaction with fuel cell for A.C. loads, A.C. Voltage build-up and controller for fuel cells-using power converters and transformers (isolation).

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Know various methods of Renewable Energy Systems.	PO1
CO2	Design the PV-Cells.	PO1,PO3
CO3	understand the wind energy system	PO1,PO2, PO3
CO4	understand the concept of fuel cell	PO1, PO3
CO5	know the applications of fuel cell	PO1,PO3

Text Books:

1. B.H.Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company, New Delhi,2009.
2. Garg L Johnson: "Wind Energy Systems" Prentice Hall. Inc, New Jersey,1985

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Reference Books:

1. Ion Boldea, "Variable speed generators", Taylor & Francis group, 2006.
2. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993

CO-PO Mapping:

CO -PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	3	-	2	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	3	3	2	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	3	-	2	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	2	3	2	-	**-**	**-**	**-**	**-**	**-**	**-**	-	-
CO*	**3**	**3**	**2**									

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE414D **CONTROL SYSTEM DESIGN**

Course Educational Objectives:
On successful completion of the course, students will be able to

1	Demonstrate knowledge on Approaches to System Design and Design for Deadbeat Response
2	Impart knowledge on design methods of state variable feedback systems
3	Demonstrate knowledge on design of robust control and optimal control
4	Impart knowledge on design of Lyapunov's stability and optimal control
5	Impart knowledge on design of state observer and stability analysis

Unit -I: Design of Feedback Control systems: (9 hours)

Introduction; Approaches to System Design; Cascade Compensation Networks; Phase-Lead Design Using the Bode Diagram; Phase-Lead Design Using the Root Locus; System Design Using Integration Networks; Phase-Lag Design Using the Root Locus; Phase-Lag , phase lead Design Using the Bode Diagram; Design on the Bode Diagram Using Analytical Methods; Systems with a Pre-filter; Design for Deadbeat Response; Design Examples.

Unit -II: Design of State Variable Feedback Systems: (9 hours)

Introduction, State space representation of physical systems, State space models of some common systems like R-L-C networks, DC motor, inverted pendulum etc., Controllable Canonical Form, Observable Canonical Form, Diagonal Canonical Form, State transition matrix, Solution of state equations, Controllability and Observability, Full-State Feedback Control Design; Observer Design; Integrated Full-State Feedback and Observer; Tracking Reference Inputs; Internal Model Design; Design Examples.

Unit -III: Introduction to Robust Control and Optimal Control: (9 hours)

Robust control system and system sensitivities to parameter perturbations, analysis of robustness, systems with uncertain parameters, considerations in design of robust control system, robust PID controller.

Unit -IV: Lyapunov's Stability and Optimal Control: (9 hours)

Positive/negative definite, positive/negative semi-definite functions, Lyapunav stability criteria, introduction to optimal control, Riccatti Equation, Linear Quadratic Regulator, Design Examples.

Unit -V: Design of State Observer and Stability analysis: (9 hours)

Design of the full order and reduced order state observer, Design of Dead beat Controller - some case studies - Stability analysis of discrete time systems based on Lyapunov approach.

TOTAL:45Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	To demonstrate knowledge on Approaches to System Design and Design for Deadbeat Response	PO1,PO2,PO3,PO4,PO12
CO2	To impart knowledge on design methods of state variable feedback systems	PO1,PO2,PO3,PO4, PO12
CO3	To demonstrate knowledge on design of robust control and optimal control	PO1,PO2, PO12
CO4	To impart knowledge on design of Lyapunov's stability and optimal control	PO1,PO2, PO12
CO5	To impart knowledge on design of state observer and stability analysis	PO1,PO2,PO12

Text Books:

1. M. Gopal, Control Systems, Principles and Design. McGraw Hill, 2nd edition 1990
2. Bernard Fried Land, Control System Design, McGraw Hill, 1st edition 1986.
3. B. C Kuo, Digital Control Systems, 2nd Edition, Oxford University Press, Inc., 1992.

Reference Books:

1.F. Franklin, J.D. Powell, and M.L. Workman, Digital control of Dynamic Systems, Addison - Wesley Longman, Inc., Menlo Park, CA , 1998.
2. C. H. Houpis and G.B. Lamont, Digital Control Systems, McGraw Hill, 1985..
3. John S. Baey, Fundamentals of Linear State Space Systems, McGraw Hill, 1st edition 1999.
4. Dorsay, Continuous and Discrete Control Systems, McGraw Hill, 2001.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	-	-	-	-	3
CO2	3	3	2	2	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**2.8**	**2**	**1.5**								**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE414E **ENERGY AUDITING AND DEMAND SIDE MANAGEMENT**

Course Educational Objectives:

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

1 Learn about energy consumption and situation in India
2 Learn about Energy Auditing in terms of loss and distribution.
3 Learn about Energy Measuring Instruments.
4 Understand the Demand Side Management.
5 Know the concept of Cost Effectiveness Tests of DSM Programs

Unit -I: Introduction to Energy Auditing **(9 hours)**

Energy Situation – World and India, Energy Consumption, Conservation, Codes, Standards and Legislation. Energy Audit- Definitions, Concept, Types of Audit, Energy Index, Cost Index, Pie Charts, Sankey Diagrams, Load Profiles, Energy Conservation Schemes. Measurements in Energy Audits, Presentation of Energy Audit Results.

Unit -II: Energy Efficient Motors and Power Factor Improvement **(9 hours)**

Energy Efficient Motors , Factors Affecting Efficiency, Loss Distribution , Constructional Details , Characteristics - Variable Speed , Variable Duty Cycle Systems, RMS Hp-Voltage Variation-Voltage Unbalance- Over Motoring- Motor Energy Audit. Power Factor– Methods of Improvement, Power factor With Non Linear Loads

Unit -III: Lighting and Energy Instruments for Audit **(9 hours)**

Good Lighting System Design and Practice, Lighting Control, Lighting Energy Audit -Energy Instruments- Watt Meter, Data Loggers, Thermocouples, Pyrometers, Lux Meters, Tong Testers, Application of PLCs

Unit -IV: Introduction to Demand Side Management **(9 hours)**

Introduction to DSM, Concept of DSM, Benefits of DSM, Different Techniques of DSM –Time of Day Pricing, Multi-Utility Power Exchange Model, Time of Day Models for Planning. Load Management, Load Priority Technique, Peak Clipping, Peak Shifting, Valley Filling, Strategic Conservation, Energy Efficient Equipment. Management and Organization of Energy Conservation Awareness Programs.

Unit -V: Economics and Cost Effectiveness Tests of DSM Programs (9 hours)

Basic payback calculations, Depreciation, Net present value calculations. Taxes and Tax Credit – Numerical Problems. Importance of evaluation, measurement and verification of demand side management programs. Cost effectiveness test for demand side management programs - Ratepayer Impact Measure Test, Total Resource Cost, Participant Cost Test, Program Administrator Cost Test Numerical problems: Participant cost test, Total Resource Cost test and Ratepayer Impact measure test.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on energy auditing and evaluate energy audit results.	PO1, PO2, PO3.
CO2	Acquire knowledge on motor energy audit	PO1,PO2
CO3	Analyze demand side management concepts through case study	PO1,PO2
CO4	Understand the Demand Side Management.	PO1,PO2
CO5	Acquire knowledge on demand side management cost Estimation.	PO1,PO2,PO3

Text Books:

1. Industrial Energy Management Systems, Arry C. White, Philip S. Schmidt, David R. Brown, Hemisphere Publishing Corporation, New York, 1994.
2. Fundamentals of Energy Engineering - Albert Thumann, Prentice Hall Inc,EnglewoodCliffs, New Jersey, 1984.

References:

1. Economic Analysis of Demand Side Programs and Projects – California Standard Practice Manual, June 2002 – Free download available online http://www.calmac.org/events/spm_9_20_02.pdf
2. Energy management by W.R. Murphy & G. Mckay Butter worth, Heinemann Publications, 2007.
3. Energy management by Paul o" Callaghan, Mc-graw Hill Book company-1st edition,1998
4. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd- 2nd edition, 1995.

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	2.8	2.6	2									

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE414F **ELECTRIC VEHICLES**

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Understand Electric and Hybrid Electric Vehicles
2 Study and analyze the Energy Storage for EV and HEV
3 Study and understand the concept of Electric Propulsion
4 Analyze and design the Electric and Hybrid Electric Vehicles
5 Study operation of Power Electronic Converter for Battery Charging.

Unit -I: Electric and Hybrid Electric Vehicles (9 hours)

Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains.

UNIT -II: Energy Storage for EV and HEV (9 hours)

Energy storage requirements, Battery parameters, Types of Batteries, Modeling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modeling of PEMFC, Super Capacitors

Unit -III: Electric Propulsion (9 hours)

EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives.

Unit -IV: Design of Electric and Hybrid Electric Vehicles (9 hours)

Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor, power rating of engine/generator, and design of PPS.Parallel Hybrid Electric Drive Train Design: Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, and energy storage design.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

Unit -V: Power Electronic Converter for Battery Charging (9 hours)

Charging methods for battery, Termination methods, charging from grid, The Z-converter, Isolated bidirectional DC-DC converter, Design of Z-converter for battery charging, High-frequency transformer based isolated charger topology, Transformer less topology.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand Electric and Hybrid Electric Vehicles	PO1,PO2,PO3
CO2	Study and analyze the Energy Storage for EV and HEV	PO1,PO2,PO3
CO3	Study and understand the concept of Electric Propulsion	PO1,PO2, PO3
CO4	Analyze and design the Electric and Hybrid Electric Vehicles	PO1,PO2,PO3
CO5	Study operation of Power Electronic Converter for Battery Charging.	PO1,PO2,PO3

Text Books:

1. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2005
2. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.

References:

1. Sheldon S. Williamson, Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Springer, 2013.
2. C.C. Chan and K.T. Chau, Modern Electric Vehicle Technology, OXFORD University Press, 2001.
3. Chris Mi, M. Abul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles Principles And Applications With Practical Perspectives, Wiley Publication, 2011.

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**									

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
IV B.Tech I Semester					
	GRAPH THEORY WITH APPLICATIONS	**2**	**1**	**0**	**3**
SUB CODE: 18OSAH411	**(OPEN ELECTIVE-II)**				

Course Educational Objectives:

The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.

1. To learn the representation of graphs and understanding the Graph Isomorphism, Sub graph Vertex degrees, Walk, Paths, Cycles-graph connection, Bipartite graphs.
2. To understand the Trees concepts, digraphs, binary relations, Shortest path algorithms and to familiarize the knowledge of graph theory
3. To understand the matrix representation of graphs, designing incidence matrix, Adjacency matrix and circuit matrix
4. To explore the use of graphs in various applications in Switching and Coding Theory
5. To identify the important graph based real time applications of electrical networks such as RLC Networks with Independent sources, LOOP circuits

UNIT 1: Graph Theory Introduction (9hours)

Graph and simple graphs (Complete graphs, Complement of graph)- Graph isomorphism–Sub graph- Vertex degrees, walk, paths, cycles-graph connection and components-Bipartite graphs.

UNIT 2: Directed graphs and shortest path algorithms (9hours)

Trees – Cut edges- Cut vertices-Blocks , Directed graphs types of directed graphs - digraphs and binary relations – directed paths and connectedness - Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm

UNIT 3: Matrix Representation of graphs (9hours)

Introduction - Adjacency matrix -Applications of Adjacency matrix-sufficient condition for isomorphism of graphs-power of an adjacency matrix-Adjacency matrix of a digraph-incidence matrix-circuit matrix-cut set matrix.

UNIT 4: Graphs in Switching and Coding Theory (9hours)

Contact Networks – Analysis of Contact Networks – Synthesis of Contact Networks – Sequential Switching Networks – Unit Cube and its Graph – Graphs in Coding Theory.

UNIT 5: Electrical Network analysis by Graph Theory (9hours)

Introduction - Kirchhoff's current and Voltage laws-Loop currents and Node Voltages- RLC Networks with Independent sources: Nodal analysis, Loop analysis.

TOTAL: 45 HOURS

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes:

After the completion of this course, a successful student is able to

Course Outcomes		POs related to Cos
CO1	Demonstrate knowledge in reading and writing rigorous mathematical proofs involving introductory aspects of graphs and develop analytical skills in solving graph theoretic problems	PO1,PO2,PO3 PO4
CO2	Demonstrate knowledge in Trees concepts, digraphs, binary relations, and Develop analytical skills in solving problems involving directed graphs and shortest path algorithm	PO1,PO2,PO3 PO4
CO3	Demonstrate knowledge in matrix representation of graphs, designing incidencematrix, Adjacency matrix and circuit matrix and explore analytical skills in solving problems involving adjacency matrix and incidence matrix	PO1,PO2,PO3 PO4
C04	Demonstrate knowledge in significant practical applications of graphs in Switching and Coding Theory; explore analytical skills in solving practical problems using graph theory concepts and Develop skills in designing Mathematical models for real time applications in coding theory.	PO1,PO2,PO3 PO4
CO5	Demonstrate knowledge in significant real time applications of electrical networks such as RLC Networks Independent sources; explore analytical skills in solving practical problems involving using graph theory concepts and Develop skills in designing Mathematical models for real time electrical networks.	PO1,PO2,PO3 PO4

Text Books:

1. Discrete mathematical structures with applications to computer science. J.P.Trimblay and R.Manohar , 27/e, Tata Mc Graw Hill Publications , 2006, New Delhi.
2. Graph Theory with applications to engineering and computer Science, NarasinghDeo, 25/e, Printice – Hall of India Private Limited, 2003, New Delhi

References:

1. Clark J. And Holton D.A., " A first look at Graph theory", Allied Publishers, 199
2. R.B.Bapat , Graphs and Matrices, Springer, London Dordrecht Heidelberg, New York, 2010 .
3. Gary Haggard John Schlipf, Sue Whitesides, Discrete Mathematics for Computer Science, 4/e, 2007, Thomson Publication, 2008, New Delhi.
4. S.D Sharma ,KedarNath Ram Nath Operation Research & Co, Meerut . 2007.
5. J.A.Bonday and U.S.R. Murty, Graph Theory with application (2nd Edition), North Holland, 1976 .

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**3**	2	-	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
IV B.Tech I Semester					
	BANKING AND INSURANCE	**3**	**0**	**0**	**3**
SUB CODE: 18OSAH412	**(OPEN ELECTIVE-II)**				

Course Educational Objectives:

1: To introduce students to the banking sector and its operations

2: To provide elaborate knowledge on functions of banking

3: To enable students to understand the digital technology in banking

4: To provide an understanding of insurance and risk management

5: To enable students to gain knowledge on various insurance organizations

UNIT II INTRODUCTIONTOBANKING (9hours)

Meaning and functions of banking, importance of banking, Reserve Bank of India- Functions

UNIT II- BANK-CUSTOMERRELATIONSHIP (9hours)

Debtor-creditor relationship, deposit products or services, payment and collection of cheques. Accounts – Types of accounts, procedure for opening and closing an account. Loans and Advances- Principles of lending, Types of loans

UNIT III -BUSINESSMODELS & ELECTRONIC PAYMENT SYSTEM (9hours)

Features, types of e-payment system, e-cash, NEFT, RTGS, Credit cards, Electr onic Wallet and Debit cards. Business models- B2B, B2C, C2C, and B2G

UNIT IV -INTRODUCTIONTORISKANDINSURANCE (9hours)

Concept of risk, risk Vs uncertainty. Insurance definition, Insurance as risk mitigation mechanism, elements of insurance

UNIT V-INSURANCE OVERVIEW (9hours)

Principles of insurance, insurance types, LIC & GIC, insurance - functions, IRDA, Insurance Players in India.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course the student will be able to,		**POs related to COs**
CO1	Demonstrate Knowledge in Tools and concepts of Banking	PO11, PO12
CO2	Explain the operations and functions of banking towards customers	PO7, PO11
CO3	Apply skills in providing solutions for Online banking and e payment	PO7,PO11, PO12
CO4	Employ the risk management practices especially the insurance mechanism.	PO9,PO11
CO5	Classify the various types of Insurance and understand the principles behind insurance	PO7, PO11

TextBooks:

1. A.V. Ranganadha Chary, R.R. Paul, *Banking and Financial system*, Kalyani Publisher, New Delhi, 2nd Edition.
2. P.K.Gupta, *Insurance and Risk Management*, Himalaya Publishing House, New Delhi.

ReferenceBooks:

1. Diwan, Praq and Sunil Sharma, *Electronic Commerce- A Manager's Guide to E-Business*, Vanity Books International, Delhi, 2002.
2. Kalakota Ravi and Whinston Andrew B, *Frontiers of Electronic Commerce*, Pearson Education India, 1996 New Delhi.
3. Schneider, Grey P, Electronic Commerce, Course Technology, Cengage Learning, 8th Edition, New Delhi, 2008.

CO-PO Mapping:

CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	-	-	-	-	-	2	2
CO2	-	-	-	-	-	-	2	-	-	-	3	-
CO3	-	-	-	-	-	-	3	-	-	-	3	-
CO4	-	-	-	-	-	-	-	-	2	-	3	-
CO5	-	-	-	-	-	-	2	-	-	-	3	-
CO*	-	-	-	-	-	-	**2.33**	-	**2**	-	**2.8**	**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
IV B.Tech I Semester					
	MANAGING INNOVATION ANDENTREPRENEURSHIP	**3**	**0**	**0**	**3**
SUB CODE:18OSAH413	**(OPEN ELECTIVE-II)**				

Course Educational Objectives:

1. To enable students understand the importance of innovation in business practices
2. To enable students to innovate new methods and practices in business using innovation approaches
3. To provide knowledge on raising finance for starting new business
4. To enable students to protect their innovation through patent and copyright
5. To motivate students to become successful entrepreneurs through constant innovation

UNIT I-Creativity and Innovation **(9hours)**

Introduction, Levels of Innovation, the Sources of Innovative Opportunity, The Innovation Process, Innovative Strategies, Creativity – Inbound, Outbound; Context and Process of New Product Development.

UNIT II-Paradigms of Innovation **(9hours)**

Innovation in the Context of Developed Economies and Emerging Economies, Performance gap, Infrastructure gap, Sustainability gap, Regulatory gap, Preference gap.

UNIT III- Intellectual Property Innovation and Entrepreneurship **(9hours)**

Introduction to Entrepreneurship, Managerial and Entrepreneurial Competencies, Paradigms of Innovation .Entrepreneurial Growth and Development, Intellectual Property – Forms of IP, Patents, Trademarks, Design Registration, Copy Rights, and Patent Process in India
.

UNIT IV-Open Innovation Framework & Problem Solving **(9hours)**

Concept of Open Innovation Approach, Limitations and Opportunities of Open Innovation Framework, Global Context of Strategic Alliance, Problem Identification and Problem Solving, Innovation and Diversification.

UNIT V-Sources of Finance and Venture Capital **(9hours)**

Importance of Finance, Strategies of Venture Funding, Investment Process, Advantages and Disadvantages of Venture Capital, Venture Capital Developments in India.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course the student will be able to,		POs related to COs
CO1	Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.	PO9,PO11
CO2	Apply the approaches to innovation for developing successful ventures	PO9, PO11
CO3	Develop a comprehensive and well planned acquisition of finance for a new venture	PO9,PO10,PO11,
CO4	Exhibit Entrepreneurial competencies and protect the innovations.	PO9,PO11
CO5	Apply ethics in constructive innovation framework	PO8, PO11,PO12

TextBooks:

1. Vinnie Jauhari, Sudhanshu Bhushan, InnovationManagement, Oxford University Press, 1st Edition, 2014.
2. Drucker, P. F., Innovation and Entrepreneurship, Taylor & Francis, 2nd Edition, 2007.

ReferenceBooks:

1. Robert D Hisrich, Claudine Kearney, Managing Innovation and Entrepreneurship, Sage Publications, 1st Edition, 2014.
2. V.K.Narayanan, Managing Technology and Innovation for Competitive Advantage, Pearson India, 1st Edition, 2002.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	-	3	-
CO2	-	-	-	-	-	-	-	-	2	-	3	-
CO3	-	-	-	-	-	-	-	-	2	-	3	-
CO4	-	-	-	-	-	-	-	-	2	-	3	-
CO5	-	-	-	-	-	-	-	3	-	-	3	2
CO*	-	-	-	-	-	-	-	**3**	**2**	-	**3**	**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-I SEM (OE)		**L**	**T**	**P**	**C**
	FUNDAMENTALS OF DBMS	**3**	**0**	**0**	**3**
SUB CODE: 18OCSE411	**(OPEN ELECTIVE-II)**				

Course Educational Objectives:

1: Discuss the basic database concepts, applications, data models, schemas and instances and design Entity Relationship (E-R) model for a database.
2: Demonstrate the use of integrity constraints, relational algebra operations and relational calculus.
3: Describe the basics of SQL, construct queries using SQL, SQL functions, trigger and cursor concepts in PL/SQL.
4: Understand reasoning about functional dependency and to make the students to identify the role of normalization in database management systems.
5:To present the students with the knowledge of Transaction, concurrency and recovery strategies of DBMS.

UNIT 1Database Systems and Entity Relationship Modeling (8hours)

Database System Applications - Purpose of Database Systems - View of Data - Database Languages - Database Users and Administrators - Database Architecture - The Entity-Relationship Model - Attributes and Entity Sets - Relationship Sets - Entity-Relationship Diagrams - Extended E-R Features.

UNIT 2 Relational Data Model (7 hours)

Introduction to the Relational Model - Integrity Constraints - Fundamental Relational Algebra Operations - Tuple Relational Calculus - Domain Relational Calculus.

UNIT 3 Introduction to SQL (12 hours)

Characteristics of SQL - advantages of SQL - SQL Data types and Literals.-Types of SQL Commands - SQL Operators and their Procedures - Form of Basic SQL Query - Examples of Basic SQL Queries - Relational Set Operators – SQL Join operators - Introduction to Nested Queries - Views - Indexes - SQL Functions - Database Triggers - Cursors in SQL – PL/SQL

UNIT 4 Normalization (9 hours)

Introduction to Schema Refinement - Properties of Decompositions – Functional Dependencies - Reasoning about Functional Dependencies - Normal Forms - First - Second - Third – BCNF - MVD - Fourth Normal Form.

UNIT 5 Transaction Processing and Concurrency Control Techniques (9 hours)

Transaction Concept - Transaction States - Implementation of Atomicity and Durability - Serializability - Recoverability - Concurrent Executions - Lock-Based Protocols for Concurrency Control - Time Stamp-Based Protocol for Concurrency Control - Multiple Granularity

Course Outcomes:

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

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on Data models and Database LanguagesandDesign Entity Relationship model for a database	PO1, PO3
CO2	Analyze the relational database theory, and be able to write relational algebra and relational calculus expressions for queries.	PO1, PO2
CO3	Analyze and evaluate the databases using SQL DML/DDL Commands	PO1, PO2, PO3, PO5
CO4	Analyze databases using normal forms to provide solutions for real time applications.	PO1, PO2
CO5	Understand the properties of transactions in a database system, Analyze concurrency control techniques for handling concurrent transactions and understand recovery of data from failures	PO1, PO3,PO4

TextBooks:

1. Database System Concepts, 6/e, 2006, Korth, Silberschatz, Sudarshan, Tata McGrawHill, New York.
2. Database Management System, 3/e, 2000,RaghuRamakrishnan, Tata McGrawHill, New York.

Reference Books:

1. Fundamentals of Database Systems, 5/e, 2008, Elmasri, Navathe, Pearson Education, USA.
2. Database Management Systems , 5/e, 2003, Peter Rob, A.AnandaRao and Carlos Coronel, Cengage Learning, USA.
3. SQL, PL/SQL Programming, 2/e, 2011, Ivan Bayross, BPB Publications, New Delhi, India.
4. Introduction to Database Systems, 8/e, 2004, C.J.Date, Pearson Education, USA.

CO-PO Mapping

PO-CO	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	2	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	3	-	2	2	-	-	-	-	-	-	-	-
CO*	**2.6**	**2.6**	**2.6**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-ISEM (OE) **L T P C**

BASICS OF INTERNET OF THINGS **3 0 0 3**

SUB CODE: 18OCSE412 **(OPEN ELECTIVE-II)**

Course Educational Objectives:

1: To understand the fundamentals of Internet of Things.
2: To learn about Building state of the art architecture in IOT.
3: To learn about basis of IOT protocols.
4: To build a small low cost embedded system using Raspberry Pi and ARDUINO,
5: To apply the concept of Internet of Things in the real world scenario.

UNIT I: Introduction To IOT **(10hours)**

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IOT- IOT Protocols -Logical Design of IOT - IOT communication models - IoT Communication APIs - IOT enabled Technologies- Wireless Sensor Networks - Cloud Computing - Big data analytics - Communication protocols - Embedded Systems.

UNIT II: M2M and IOT Architecture **(8hours)**

The Vision - Introduction - From M2M to IOT. M2M high-level ETSI architecture - IETF architecture for IOT - OGC architecture - IOT reference model - Domain model - information model - functional model - communication model - IOT reference architecture.

UNIT III: IOT Protocols **(9hours)**

Protocol Standardization for IOT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security

UNIT IV: Building Iot With Raspberry Pi & Arduino **(9hours)**

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms – Arduino.

UNIT V : Case Studies And Real-World Applications **(9hours)**

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IOT – Software & Management Tools for IOT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IOT

Course Outcomes:

After the successful completion of this course, the students should be able to:

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on fundamentals of Internet of Things and its functionalities.	PO1, PO2
CO2	Demonstrate knowledge on Building state of the art architecture in IOT.	PO1, PO2
CO3	Analyze various protocols for IOT	PO1, PO2,
CO4	Design a portable IOT using Raspberry Pi	PO1, PO2, PO3, PO4
CO5	Deploy an IOT application and connect to the cloud using Raspberry Pi & ARDUINO and apply the concept of Internet of Things in the real world scenario.	PO1, PO2, PO3, PO4, PO5

Text Books:

1. Internet of Things – A hands-on approach, ArshdeepBahga, Vijay Madisetti, 2015, Universities Press.
2. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, 2014, Academic Press.

References:

1. Internet of Things (A Hands-on-Approach), 1stEdition, Vijay Madisetti and ArshdeepBahga, 2014,VPT.
2. Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, Francis daCosta, Apress Publications, 2013
3. Architecting the Internet of Things, Bernd Scholz-Reiter, Florian Michahelles, ISBN 978- 3842-19156-5, and Springer.

CO – PO Mapping

PO-CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	2	2	3	3	-	-	-	-	-	-	-	-
CO4	2	2	3	3	-	-	-	-	-	-	-	-
CO5	3	3	2	2	3	-	-	-	-	-	-	-
CO*	**2.6**	**2.4**	**2.6**	**2**	**3**	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-ISEM (OE) | **L T P C**

INFORMATION SECURITY | **3 0 0 3**

SUB CODE: 18OCSE413 **(OPEN ELECTIVE-II)**

Course Educational Objectives:

The main objectives of this course are:

1. The course will incorporate the foundational understanding of Information Security.
2. The course will incorporate the threats and network perimeter security design principles.
3. Provide abilities to review procedures for installation.
4. Troubleshooting and monitoring of network devices to maintain integrity, confidentiality and availability of data and devices.

Unit-I Introduction: **(9hours)**

Security mindset, Computer Security Concepts (CIA), Threats, Attacks, and Assets

Unit-II Cryptographic Protocols: **(9hours)**

Introduction to Protocols, Communications using Symmetric Cryptography, Substitution Ciphers and Transposition Cipher, Block cipher, Stream cipher, Modes of operation, Symmetric and Asymmetric cryptography.

Unit-III Information Security Threats: **(9hours)**

Virus, Malware, DDoSattack, Trojan, Worm, Spyware, Social Engineering, and Phishing attacks, man-in-middle attack, DNS poisoning.

Unit –IV Proxy & Firewalls: **(9hours)**

Working of Stateful Firewall, the Concept of State, Stateful Filtering and Stateful Inspection, Fundamentals of Proxying, Pros and Cons of Proxy Firewalls, Types of Proxies, and Tools for Proxying.

Unit –V Network Intrusion Detection & Prevention Systems: **(9hours)**

Network Intrusion Detection Basics, the Roles of Network IDS in a Perimeter Defense, IDS Sensor Placement, IPS, IPS Limitations, NIPS ,Host Based Intrusion Prevention Systems, Traffic Monitoring.

Course Outcomes:

After the successful completion of this course, the students should be able to:

Course Outcomes		POs related to COs
CO1	Apply fundamental concepts of Information Security threats and vulnerabilities to adopt right security measures and design real time scenarios	PO1, PO2,PO3
CO2	Monitor and maintain a secure network consisting of enterprise level routers and switches.	PO1, PO2,PO3
CO3	Analyze various protocols for IOT	PO1, PO2,PO3
CO4	Design/develop/ implement the security solution for a given application	PO1, PO2, PO3
CO5	Detect the different types of intrusions	PO1, PO2, PO3, PO4,

Text Books:

1. W. Stallings, Network Security Essentials (6th Edition), Prentice Hall.
2. W. R. Stevens, TCP/IP Illustrated, Vol. 1: The Protocols, AddisonWesley 1993

References
1. D. E. Comer, Internetworking with TCP/IP, Vol.1 (4th Edition), Prentice Hall, 2000
2. R. Oppliger, Internet and Intranet Security (2nd edition), Artech House, 2002
3. W.R.Cheswick and S.M.Bellovin, Firewalls and Internet security(2nd edition), Addison-Wesley, 2003

CO-PO Mapping

PO-CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	2	3	2	-	-	-	-	-	-	-	-	-
CO5	2	3	3	2	-	-	-	-	-	-	-	-
CO*	**2.4**	**3**	**2.6**	**2.5**	-	-	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV B.Tech I Semester **L T P C**

TRANSPORT AND ENVIRONMENT 3 0 0 3

SUB CODE: 18OCIV411 (OPEN ELECTIVE-II)

Course Educational Objectives:

1. The objective of this course is to create an awareness / overview of the impact of Transportation Projects on the environment and society.
2. To improve the environmental impact predictions
3. To study the water, air, land and noise assessment
4. To study the environmental mitigation.
5. To study the environmental case studies

UNIT 1: INTRODUCTION (9 hours)

Environmental inventory, environmental assessment, environmental impact assessment (EIA), environmental impact of transportation projects, need for EIA, EIA guidelines fortransportation project, historical development.

UNIT 2: METHODOLOGIES (9 hours)

Elements of EIA – Screening and scoping – Methods of impact analysis – Applications –appropriate methodology.

UNIT 3: ENVIRONMENTAL IMPACT, PREDICTION AND ASSESSMENT

(9 hours)

Prediction and assessment of impact of transportation project at various stages on water, air, noise, land acquisition and resettlement, socio economic impact, indigenous people, aesthetics, health and safety, energy studies, IRC guidelines.

UNIT 4: ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN

(9 hours)

Mitigation of the impact on natural and man-made environment, health, water, land, noise, air, public participation, environmental management plan, energy conservation, methods to reduce global warming.

UNIT 5: EIA CASE STUDIES (9 hours)

EIA case studies on highway, railway, airways and waterways projects.

TOTAL : 45 HOURS

Course Outcomes:

Upon completion of this course the student will be able to		POs related to COs
CO1	Explain the impact of transportation projects on the environment	PO1, PO2
CO2	Demonstrate the impact of environmental laws on transportation projects	PO1, PO2 ,
CO3	Demonstrate the impact of transportation project on the water, air, land and noise	PO1, PO2
CO4	Explain the environmental mitigation	PO1
CO5	Analyses the environmental case studies	PO1, PO2 ,

Text Books:

1. Environmental Impact Assessment, Canter, L.R., 1996, McGraw Hill, New Delhi.
2. Indian Road Congress (IRC), Environmental Impact of Highway Projects, IRC, 1998, Delhi.
3. Elements of Environmental Science and Engineering, P. Meenakshi, 2006, Prentice Hall of India, New Delhi.
4. Introduction to Environmental Science and Management, Thirumurthy A.M., 2005, Shroff Publishers, Bombay.

Reference Books:

1. John G.Rau and David, C.Hooten, Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1995.
2. James H.Banks, Introduction to Transportation Engineering, McGraw Hill Book Company, 2000.
3. A Handbook on Roads and Environment, World Bank, Vol.I and II, 1997, Washington DC.
4. International Encyclopedia of Ecology and Environment – EIA, Indian Institute of Ecology and Environment, PriyaRanjanTrivedi, 1998, New Delhi, Hyderabad: Indian Green Building Council.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-
CO4	3				-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO*	2	2			-	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV B.Tech I Semester | **L T P C**

DISASTER MANAGEMENT | **3 0 0 3**

SUB CODE: 18OCIV412 **(OPEN ELECTIVE-II)**

Course Educational Objectives:

1. To explain disasters, their significance and types.
2. To demonstrate the disaster prevention and risk reduction methods.
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
4. To enhance awareness of institutional processes in the country.
5. To explain the disaster management case studies

UNIT 1: INTRODUCTION TO DISASTERS (9hours)

Definition: Disaster, hazard, vulnerability, resilience, risks – Disasters: types of disasters –Earthquake, landslide, flood, drought, fire etc – Classification, causes, impacts including social, economic, political, environmental, health, psychosocial, etc. – Differential impacts in terms of caste, class, gender, age, location, disability – Global trends in disasters: urban disasters, pandemics, complex emergencies, climate change – Dos and don'ts during various types of disasters.

UNIT 2: APPROACHES TO DISASTER RISK REDUCTION (DRR) (9 hours)

Disaster cycle – Phases, culture of safety, prevention, mitigation and preparedness communitybased DRR, structural – Nonstructural measures, roles and responsibilities of community,panchayat raj institutions/urban local bodies (PRIs/ULBs), states, centre, and other stakeholders – Institutional processes and framework at state and central level – State disaster management authority (SDMA) – Early warning system – Advisories from appropriate agencies.

UNIT 3: INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT (9 hours)

Factors affecting vulnerabilities, differential impacts, impact of development projects such as dams, embankments, changes in land use etc. – Climate change adaptation – IPCC scenario and scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT 4: DISASTER RISK MANAGEMENT IN INDIA (9 hours)

Hazard and vulnerability profile of India, components of disaster relief: water, food, sanitation, shelter, health, waste management, institutional arrangements (mitigation, response and preparedness, disaster management act and policy – Other related policies, plans, programmes and legislation – Role of GIS and information technology components in preparedness, risk assessment, response and recovery phases of disaster – Disaster damage assessment.

UNIT 5: DISASTER MANAGEMENT: APPLICATIONS, CASE STUDIES AND FIELDWORKS (9 hours)

Landslide hazard zonation: case studies, earthquake vulnerability assessment of buildings and infrastructure: case studies, drought assessment: case studies, coastal flooding: storm surge assessment, floods: fluvial and pluvial flooding: case studies; forest fire: case studies, man-made disasters: case studies, space based inputs for disaster mitigation and management and field works related to disaster management.

TOTAL : 45 HOURS

Course Outcomes:

Upon completion of this course the student will be able to		**POs related to COs**
CO1	Differentiate the types of disasters, causes and their impact on environment and society	PO1, PO2
CO2	Assess vulnerability and various methods of risk reduction measures as well as mitigation	PO1, PO2 ,
CO3	Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management	PO1, PO2
CO4	To analyse the disaster management techniques	PO1, PO2 ,PO3
CO5	To describe the situations of disaster management case studies	PO1, PO2 ,

Text Books:

1. Disaster Management, Singhal J.P. 2010, Laxmi Publications, ISBN-10: 9380386427; ISBN-13: 978-9380386423
2. Disaster Science and Management, Tushar Bhattacharya, 2012, McGraw Hill India Education Pvt. Ltd., ISBN-10: 1259007367, ISBN-13: 978-1259007361

Reference Books:

1. Govt. of India: Disaster Management Act, Government of India, 2005, New Delhi.
2. Government of India, National Disaster Management Policy, 2009.
3. Environmental Knowledge for Disaster Risk Management, NIDM, Gupta Anil K, Sreeja S. Nair. 2011, New Delhi.
4. Vulnerable India: A Geographical Study of Disasters, KapurAnu 2010, IIAS and Sage Publishers, New Delhi.

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	-	-	-	-	-	-	-	-	-	-
CO2	1	3	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-
CO4	1	1	3	-	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO*	**1.6**	**2.6**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
IV B.Tech I Semester	**AIR POLLUTION AND CONTROL ENGINEERING**	**3**	**0**	**0**	**3**
SUB CODE: 18OCIV413	**(OPEN ELECTIVE-II)**				

Course Educational Objectives:

1. To impart knowledge on the principle and design of control of indoor.
2. To study about meteorology.
3. To learn about particulate/ gaseous air pollutant and its emerging trends.
4. An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
5. Ability to identify, formulate and solve air and noise pollution problems

UNIT – 1: INTRODUCTION (9 hours)

Structure and composition of atmosphere – Definition, scope and scales of air pollution –Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility – Ambient air quality and emission standards – Ambient and stack sampling and analysis of particulate and gaseous pollutants.

UNIT – 2: METEOROLOGY (9 hours)

Effects of meteorology on air pollution – Fundamentals, atmospheric stability, inversion, wind profiles and stack plume patterns – Atmospheric diffusion theories – Dispersion models, plume rise.

UNIT – 3: CONTROL OF PARTICULATE CONTAMINANTS (9 hours)

Factors affecting selection of control equipment – Gas particle interaction – Working principle, design and performance equations of gravity separators, centrifugal separators fabric filters, particulate scrubbers, electrostatic precipitators – Operational considerations.

UNIT – 4: CONTROL OF GASEOUS CONTAMINANTS (9 hours)

Factors affecting selection of control equipment – Working principle, design and performance equations of absorption, adsorption, condensation, incineration, bio scrubbers, bio filters – Process control and monitoring – Operational considerations.

UNIT – 5: INDOOR AIR QUALITY MANAGEMENT (9 hours)

Sources types and control of indoor air pollutants, sick building syndrome types – Radon pollution and its control – Sources and effects of noise pollution – Measurement – Standards– Control and preventive measures

TOTAL: 45 HOURS

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(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes:

Upon completion of this course the student will be able to		**POs related to Cos**
CO1	To impart knowledge on the principle and design of control of indoor.	PO1, PO2
CO2	To study about meteorology.	PO1, PO2
CO3	To learn about particulate/ gaseous air pollutant and its emerging trends.	PO1, PO2
CO4	An understanding of the nature and characteristics of air pollutants, noise pollution andbasic concepts of air quality management	PO1, PO2 ,PO3,PO4
CO5	Ability to identify, formulate and solve air and noise pollution problems	PO1, PO2 ,

Text Books:

1. Air Pollution Control Engineering, Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, 2004, Tokyo.
2. Air Pollution and Control Technologies, Anjaneyulu. Y, 2002, Allied Publishers (P) Ltd., India.

Reference Books:

1. Air Pollution, David H.F. Liu, Bela G. Liptak, 2000, Lweis Publishers.
2. Air Pollution (Vol.I – Vol.VIII), Arthur C.Stern, 2006, Academic Press.
3. Air Pollution Engineering Manual, Wayne T.Davis, 2000, John Wiley & Sons, Inc.
4. Air Pollution Control Engineering, Noel de Nevers, 1995, McGraw Hill, New York.

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	1	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	1	1	3	3	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO*	**1.6**	**2.6**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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IV B.Tech I Semester		**L**	**T**	**P**	**C**
	QUALITY CONTROL AND RELIABILITY ENGINEERING	**3**	**0**	**0**	**3**
SUB CODE: 18OMEC411	**(OPEN ELECTIVE-II)**				

Course Educational Objectives:

1. To understand the concepts of quality, TQM, and statistical process control
2. To learn TQM principles and impact in continuous process improvement.
3. To study the online quality control system in an organization
4. To learn the concepts of offline quality control systems in an organization.
5. To study concepts of Reliability and Estimation

UNIT – 1: QUALITY CONCEPTS AND STATISTICAL PROCESS CONTROL (9 hours)

Quality Concepts: Need for quality – Evolution of quality – Definition of quality – Dimensions of quality – Basic concepts and definition of TQM – Contributions of Deming, Juran and Crosby. **Statistical Process Control:** Inspection – Quality Control – Quality assurance – Customer orientation – Internal & External Customer – Life cycle Quality cost – The seven traditional tools of quality – New management tools

UNIT – 2: QUALITY PRINCIPLES AND TOOLS (9 hours)

Leadership – Strategic quality planning – Quality statements – Customer focus, customer orientation, customer satisfaction, customer complaints and customer retention – Employee involvement – Motivation – Empowerment – Team and teamwork – Recognition and reward – Performance appraisal – Continuous process improvement – PDSA cycle, 5s, Kaizen – Supplier partnership – Partnering, supplier selection and supplier rating – Six-sigma concepts – Bench marking – TPM concepts.

UNIT – 3: ONLINE QUALITY CONTROL (9 hours)

Control chart for attributes – Control chart for non-conforming – *p* chart and *np* chart – Control chart for nonconformities: C and U charts – Control chart for variables: X chart, R chart and σ chart – State of control and process out of control identification in charts – Pattern study – Process capability studies.

UNIT – 4: OFFLINE QUALITY CONTROL (9 hours)

Lot by lot sampling – Types – Probability of acceptance in single, double, multiple sampling techniques – O.C. curves – Producers risk and consumers risk – AQL – LTPD – AOQL concepts – Standard sampling plans for AQL and LTPD – Uses of standard sampling plans.

UNIT – 5: RELIABLITY CONCEPTS AND ESTIMATION (9 hours)

Reliability Concepts: Reliability engineering – Fundamentals – Failure data analysis – Mean failure rate, Mortality curves concept of burn in period – Useful life and wear out phase of a system – Mean time to failure – Meantime between failure – Hazard rate – Failure density and conditional reliability – Maintainability and availability – simple problems. **Reliability Estimation:** Series, parallel and mixed configurations – Reliability improvement techniques – Use of pareto analysis – Design for reliability – redundancy unit and standby redundancy – Fault tree analysis – Optimization in reliability.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Illustrate the quality concepts of statistical process control, and contributions TQM Gurus in quality management	**PO1,PO11, PO12**
CO2	Recognize the quality principles and impact of 5s, Kaizen, PDSA cycles in continuous process improvement.	**PO1,PO11, PO12**
CO3	Demonstrate the basic need of online quality control and process control in an organization	**PO1,PO2, PO3, PO11, PO12**
CO4	Explain the basic need of offline quality control and process control in an organization	**PO1,PO2, PO3, PO11, PO12**
CO5	Realize the concepts of Reliability and Estimation	**PO1, PO2,PO11, PO12**

Text Books:

1. Quality Control, Besterfield D.H., 8/e, 2009, Pearson Education, India.
2. Reliability Engineering, E Balagurusamy, 2017, McGraw Hill India

Reference Books:

1. Introduction to Statistical Quality Control, Douglas.C. Montgomery, 7/e, 2013, John Wiley.
2. Statistical Methods for Quality, Reliability and Maintainability, K.Muralidharan and A Syamsundar, 2012, PHI Learning.
3. Statistical Quality Control, Monohar Mahajan, 2001, Dhanpat Rai &and Sons.
4. Reliability, Maintainability and Risk, David J Smith, 8/e, 2011, Butterworth-Heinemann, Elsevier Ltd.
5. Fundamentals of Quality Control and Improvement, Amitava Mitra, 4/e, 2016, JohnWiley&Sons,Inc.
6. Reliability Engineering, Kailash C. Kapur and Michael Pecht, 2014, John Wiley & Sons, Inc.

Codes/Tables: Use of approved statistical table permitted in the examination.

CO-PO Mapping

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	1	2
CO.2	3	-	-	-	-	-	-	-	-	-	1	2
CO.3	3	2	1	-	-	-	-	-	-	-	1	2
CO.4	3	2	1	-	-	-	-	-	-	-	1	2
CO.5	3	2	-	-	-	-	-	-	-	-	1	2
CO*	**3**	**2**	**1**	-	-	-	-	-	-	-	**1**	**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
(Autonomous)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV B.Tech I Semester		**L**	**T**	**P**	**C**
	INDUSTRIAL ENGINEERING AND PSYCHOLOGY	**3**	**0**	**0**	**3**
SUB CODE: 18OMEC412	**(OPEN ELECTIVE-II)**				

Course Educational Objectives:

1. To learn the concepts of management and characteristics of personnel management and organization
2. To understand the organizational structures and plant layout for productivity improvements
3. To know the productivity, planning and control of a product
4. To discover the material handling techniques and Inventory control of manufacturing a product
5. To learn the industrial psychology and work study in an industry

UNIT – 1: CONCEPTS OF MANAGEMENT (9 hours)

Management: Importance of administration and organization – Managerial skills, policies, goals and objectives – Scientific management – Contribution of FW Taylor, Henry Foyal and Gilberth – Principles, types, process, levels and functions of management – Management chart – Basic concepts in project management and MIS – Industrial ownership – Responsibilities of supervisor/foreman – Leadership concepts. **Personnel Management:** Recruitment, selection, training, job evaluation and merit rating – Wage plans and incentives – Welfare measures – Promotion, lay-off, transfer and discharge.

UNIT – 2: ORGANIZATIONAL STRUCTURES AND PLANT LAYOUT (9 hours)

Organization: Concept, importance, characteristics, elements, and process of organization – Organization theory, principle, structure, chart and committees – Project, matrix and informal organization – Departmentation – Authority and delegation – Group dynamics – Organizational change, development and conflict – Managerial leadership and communication system. **Plant Layout:** Types – Flow pattern – Work station – Storage space – Layout procedure – Consideration in factory design.

UNIT – 3: PRODUCTION PLANNING AND CONTROL (9 hours)

Productivity: Input output model – Factors affecting the productivity – Productivity resources and measures. **Production Planning:** Continuous and intermittent production – Job, open and closed job shop – One time large projects – Forecasting – Process planning – Economical batch quantity – Tool control – Control of production – Loading, scheduling, dispatching and routing – Progress and flow control.

UNIT – 4: MATERIALS MANAGEMENT AND INVENTORY CONTROL (9 hours)

Materials Management: Concepts – Procurement – Purchase and order – Buying techniques. **Inventory Control:** Classification – Objectives – Functions – Economic order quantity (EOQ) – Inventory models – ABC analysis – Material requirements planning (MRP) – Manufacturing resource planning (MRP-II).

UNIT – 5: WORK STUDY AND INDUSTRIAL PSYCHOLOGY (9 hours)

Work study: Ergonomics principles – Method study – Process chart symbols – Flow process and multiple activity chart – Flow and string diagram – Operation analysis – Analysis of motion – Design of work place – Therbligs – SIMO chart – Time study – Standard data – Analytical estimating – Performance rating – Allowances – PMTS. **Industrial Psychology:** Concept – Individual and group – Motivation theories – Hawthorne experiment – Morale and motivation – Working and environmental condition – Industrial fatigue.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the concepts of management and characteristics of personnel management and organization	**PO1, PO11, PO12**
CO2	Explain the organizational structures and plant layout for productivity improvements	**PO1,PO2, PO11, PO12**
CO3	Describe the productivity, planning and control of a product	**PO1,PO2, PO11, PO12**
CO4	Explain the material handling techniques and Inventory control of manufacturing a product	**PO1,PO2, PO11, PO12**
CO5	Demonstrate the industrial psychology and work study in an industry	**PO1,PO2, PO11, PO12**

Text books:

1. Industrial Engineering and Management, 17/e, 2010, O.P. Khanna, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Industrial Engineering and Management, Pravin Kumar, 1/e, 2015, Pearson Education, New Delhi.

Reference books:

1. Production and Operations Management, S. N. Chary, 6/e, 2019, Tata McGraw-Hill Education Pvt. Ltd., Noida.
2. Operations Management, William J Stevenson, 12/e, 2018, Tata McGraw-Hill Education Pvt. Ltd., Noida.
3. Production and Operations Management, Shailendra Kale, 1/e, 2013, Tata McGraw-Hill Education Pvt. Ltd., Noida.
4. Production and Operations Management, Kanishka Bedi, 3/e, 2013, Oxford University Press, India.

CO-PO Mapping

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	2	-	-	-	-	-	-	-	-	-	1	1
CO.2	2	2	-	-	-	-	-	-	-	-	1	1
CO.3	2	2	-	-	-	-	-	-	-	-	1	1
CO.4	2	2	-	-	-	-	-	-	-	-	1	1
CO.5	2	2	-	-	-	-	-	-	-	-	1	1
CO*	**2**	2	-	-	-	-	-	-	-	-	1	1

IV B.Tech I Semester		L	T	P	C
	3D PRINTING AND DESIGN	3	0	0	3
SUB CODE: 18OMEC413	(OPEN ELECTIVE-II)				

Course Educational Objectives:

1. To know the need and development of additive manufacturing technology.
2. To study the design for additive manufacturing and tool design
3. To recognize the parameters of photo polymerization and LOP
4. To explain powder bed fusion processes, binder and material jetting process
5. To know the post processes technique and applications of additive manufacturing process
6.

UNIT – 1: OVERVIEW OF ADDITIVE MANUFACTURING (AM) (7 hours)

Overview – Fundaments of Rapid Prototyping (RPT) – Additive V/s Conventional Manufacturing – Generic AM process – Development of AM technology – Use of layers – Classification of AM process – AM process chain – Basic steps for AM process – Differentiation between photopolymer system, powder based system, molten material system, solid sheets and metal system.

UNIT – 2: CAD MODELING AND DESIGN FOR ADDITIVE MANUFACTURING (11 hours)

CAD Modeling: Preparation of CAD models – Data processing – STL format – Model slicing – Tool path generation – Data translation and loss – Customized design and fabrication for medical applications. **DFAM:** AM unique capabilities – DFAM concepts for complex geometry, integrated assemblies, customized geometry, multifunctional design and constraints – Part consolidation, redesign, structures and industrial applications – Light weight structure, optimization methods and topology. **Printing Processes:** Droplet formation technologies – Continuous mode – Drop on demand mode – Bioplotter.

UNIT – 3: LIQUID AND SOLID BASED ADDITIVE MANUFACTURING PROCESS (9 hours)

Stereo lithography (SLA): Polymerization materials – Process – Patterns – Vat photo polymerization process – Benefits – Applications. **Fused Deposition Modeling (FDM**): Principle – Materials – Limitations – Benefits – Applications. **Laminated Object Manufacturing (LOM):** Bonding process – Adhesive bonding and thermal bonding – Materials – Limitation – Application.

UNIT – 4: POWDER BASED ADDITIVE MANUFACTURING PROCESS (9 hours)

Selective Laser Sintering (SLS): Process – Materials – Powder fusion mechanism – Powder handling – Applications. **Selective Laser Melting (SLM) and Electron Beam Melting (EBM):** Principle – Materials – Process – Benefits – Applications. **Laser Engineered Net Shaping (LENS):** Materials – Material delivery – Process parameters – Benefits – Applications. **Binder Jetting:** Materials – Process – Benefits. **Material Jetting:** Materials – Process – Multijet modeling – Benefits.

UNIT – 5: POST PROCESSINGTECHNIQUES AND APPLICATIONS (9 hours)

Product Quality: Material removal – Surface texture improvements – Accuracy improvements – Aesthetic improvements – Preparation for use of pattern – Property enhancement using thermal and non thermal techniques – Inspection and testing – Defects and their causes. **Applications:** Additive

Manufacturing application of aerospace, electronics, healthcare, defense, automotive, construction, food processing, machine tool – Business opportunities and future directions of AM.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand the need and development of additive manufacturing technology	**PO1, PO2, PO3**
CO2	Explain the design for additive manufacturing and tool design	**PO1, PO2, PO3**
CO3	Illustrate the parameters of photo polymerization and Laminated Object Manufacturing	**PO1, PO2, PO3, PO5**
CO4	Explain powder bed fusion processes, binder and material jetting process	**PO1, PO2, PO3, PO5**
CO5	Summarize the post processes technique and applications of additive manufacturing process	**PO1, PO2, PO3, PO5**

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping and Direct Digital Manufacturing, Ian Gibson, David W.Rosen and Brent Stucker, 2/e, 2015, Springer.
2. Rapid Prototyping: Principles and Applications, Chee Kai Chua, Kah Fai Leong and Chu Sing Lim 3/e, 2010, World Scientific Publishers.

Reference Books:

1. Additive manufacturing: Innovations, Advances, and Applications, T.S. Srivatsan and T.S. Sudarshan, Taylor & Francis Group, LLC.
2. Additive Manufacturing of Emerging Materials, Bandar AlMangour, 2018, Springer.
3. 3D Printing and Additive Manufacturing Technologies, L. Jyothish Kumar, Pulak M. Pandey and David Ian Wimpenny, 2019, Springer Nature Singapore Pte Ltd.
4. 3D Printing: Technology, Applications, and Selection, Rafiq Noorani, 2018, CRC Press, Taylor & Francis Group.
5. Design for Additive Manufacturing, Martin Leary, 2019, Elsevier.
6. Additive Manufacturing Handbook: Product Development for the Defense Industry, Adedeji B. Badiru, Vhance V. Valencia, and David Liu, 2017, CRC Press, Taylor & Francis Group.

CO-PO Mapping

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	1	-	-	-	-	-	-	-	-	-
CO.2	3	2	1	-	-	-	-	-	-	-	-	-
CO.3	3	2	1	-	2	-	-	-	-	-	-	-
CO.4	3	2	1	-	2	-	-	-	-	-	-	-
CO.5	3	2	1	-	2	-	-	-	-	-	-	-
CO*	**3**	**2**	**1**	-	**2**	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
IV B.Tech I Semester					
	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	**3**	**0**	**0**	**3**
SUB CODE: 18OCSE411	**(OPEN ELECTIVE-II)**				

Course Educational Objectives:

1: To study the concepts of Artificial Intelligence.
2: To Understand the search strategies and Problem solving using Artificial Intelligence.
3: To gain insight information about Logical Agents and Reasoning patterns in propositional logic
4: To study the Uncertain Knowledge and Reasoning
5: To study the Application of Robotics and predictive analytics using Rapid Miner

Unit I: Introduction to Artificial Intelligence, Problems, Problem Spaces and Search (9hours)

The AI Problems - The underlying assumption - The AI technique - The levels of the model - Criteria of success - Some general references - One final word and beyond - Defining the problem as a State space search - Production systems - Problem characteristics - Production system characteristics - Issues in the design of search programs

Unit II: Problem Solving, Un-Informed Search Strategies, Informed Search and Exploration (9hours)

Uninformed search strategies - Avoiding repeated states - Informed (Heuristic) search strategies - Heuristic functions - Local search algorithms and optimization problems - Local search in continuous spaces - Backtracking search for CSPs.

Unit III: Knowledge and Reasoning (9hours)

Logical agents – Knowledge based agents - The wumpus world – Logic - Propositional logic - a very simple logic - Reasoning patterns in propositional logic - Effective propositional inference - Agents based on propositional logic

Unit IV: Uncertain Knowledge and Reasoning, Learning (9hours)

Uncertainty - Acting under uncertainty - Baye's rule and its use - Learning from observations - Forms of learning - Inductive learning - Learning decision trees

Unit V: Robotics and Predictive Analytics (9hours)

Robotics: Introduction-Robot hardware - Robotic perception - Planning to move-Robotic software Architectures - Application Domains
Case Study1: Medical Data Analysis using Rapid Miner Tool
Case Study2: Agriculture Data Analysis using Rapid Miner Tool

TOTAL: 45 HOURS

Course Outcomes:

On Successful completion of this course the students will be able to		POs related to COs
CO1	Gain the basic Knowledge about AI technique and Production systems	PO1
CO2	Comprehend the Un informed and Informed Search Strategies.	PO1, PO3
CO3	Analyze and Implement Reasoning patterns in propositional logic	PO1, PO2
CO4	Formulate the Knowledge and Reasoning techniques in solving problems	PO1, PO4
CO5	Apply Robotics to Solve Real world Problems and use rapid miner applications	PO1, PO2, PO4, PO9

Text Books:

1. Artificial Intelligence A Modern Approach, 2/e, Stuart Russell and Peter Norvig, 2003, Pearson Education, New Delhi, India.
2. Artificial Intelligence, 3/e, Elaine Rich, Kevin Knight and Shiva Shankar B Nair, 2004, Tata McGraw Hill, Hyderabad, India.

Reference Books:

1. Artificial Intelligence Structures and Strategies for Complex Problem Solving, 5/e, George F. Luther, 2005, Pearson Education, New Delhi, India.
2. Introduction to Artificial Intelligence, 1/e, Eugene Charniak and Drew McDermott, 1985, Pearson Education, New Delhi, India.
3. Artificial Intelligence: The Basics, 1/e, Kevin Warwick, 2012, Wearset ltd, Boldon.
4. Introduction to Artificial Intelligence, 2/e, Philip C. Jackson, 1985, Dover Publications, New York, USA.
5. Our Final Invention: Artificial Intelligence and the End of the Human Era, 1/e, James Barrat, 2013, Thomas Dunne Books, New York, USA.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	3	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	2	-	-	-	-	-	-	-	-
CO5	2	2	-	2	-	-	-	-	1	-	-	-
CO*	**2**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**

IV B.Tech I Semester		L	T	P	C
	FUNDAMENTALS OF EMBEDDED SYSTEMS	3	0	0	3
SUB CODE:18OECE412	(OPEN ELECTIVE-II)				

Course Educational Objectives:

1: To provide a basic knowledge like characteristics, classification and Application areas of Embedded Systems.

2: Students learn the Architecture, Memory Interfacing and Interrupt Structures of 8051.

3: By learning instruction sets we can write the Assembly Language Programs and get knowledge In interfacing techniques.

4: Students will learn the Real time operating systems.

5: To learn Communication and Interfacing Techniques and its buses.

Unit I: Introduction (9hours)

History of Embedded Systems-Classification of Embedded systems-Purpose of Embedded system-Characteristics of Embedded systems- Major Application Areas of Embedded Systems- Core of the Embedded System- Sensors and Actuators- Embedded Firmware, Applications- Washing Machine

UNITII: The 8051 Architecture (9hours)

Introduction- 8051 Micro controller Hardware- Register set of 8051-Input/Output Ports and Circuits-External Memory- memory and I/O interfacing of 8051Counter and Timers- Serial data Input/Output-Interrupt structure of 8051.

Unit III: Basic Assembly Language Programming Concepts (9hours)

The Assembly Language Programming Process- Programming Tools and Techniques- Programming the 8051. Data Transfer and Logical Instructions. Arithmetic Operations- Decimal Arithmetic. Jump and Call Instructions.

Applications: Interfacing with Keyboards- Displays- D/A and A/D Conversions- Multiple Interrupts

UNIT-4:Real-Time Operating Systems (RTOS) (9hours)

Operating System Basics- Types of Operating Systems- Tasks- Process and Threads-Multiprocessing and Multitasking- Task Scheduling- Threads- Processes and Scheduling: Putting them Altogether- Task Communication- Task Synchronization- Device Drivers- How to Choose an RTOS.

UNIT- 5: Communication Interface and Communication Buses. (9hours)

Communication interface- (Board level communication interfaces- Product level communication interfaces)- Timing -and Counting Devices- Watchdog Timer- Real Time Clock- Networked Embedded Systems- Serial Bus Communication Protocols- Parallel Bus Device Protocols- Parallel Communication Network Using ISA- PCI- PCI-X and Advanced Buses.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of course, student will be able to:

Course outcomes		P0s related to C0s
C01	Understanding and designing of embedded systems	P01, P02, P03, P04,P06
C02	Learning the Architecture and its functions	PO1,P02,P03,P06
C03	Knowledge to write the programs in Assembly Language programs	P01, P02, P03, P04
C04	Knowledge in real time operating systems	P01, P03,P04,P05,P06
C05	Understanding the transmissions through different types of buses	P01, PO2,P03,P04,P05,P06

TEXT BOOKS:

1. Introduction to Embedded System-2nd edition- 2003-Shibu KV- Mc-Graw Hill -New Delhi.
2. The 8051 Microcontroller-3rd Edition-2007- Kenneth J.Ayala- Thomson Delmar Learning- New Delhi.
3. Embedded system architecture- programming and design-sixthreprint- 2005- Rajkamal- TMH-New Delhi.

CO-PO MAPPING

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	2	-	-	-	-	--	-
CO2	3	2	2	-	-	3	-	-	-	-	--	-
CO3	3	3	3	2	-	-	-	-	-	-	--	-
CO4	3	-	3	3	2	2	-	-	-	-	--	-
CO5	3	3	3	3	2	2	-	-	-	-	--	-
CO*	**3**	**2.75**	**2.8**	**2.5**	**2**	**2.25**	-	-	-	-	--	-

IV B.Tech I Semester		L	T	P	C
	DATA COMMUNICATION AND NETWORKS	3	0	0	3
SUB CODE:18OECE413	(OPEN ELECTIVE-II)				

Course Educational Objectives:

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts.
4. Preparing the student forentry Advanced courses in computer networking.
5. Allow the student to gain expertise in some specific areas of networking.

UNIT – 1: Introduction to data communication (9hours)

Introduction: Network Topologies, Protocols & Standards, Layered Architecture LAN, WAN, MAN. OSI Reference Model, TCP/IP Reference Model, Guided and Unguided Media.

UNIT – 2: Data link layer (9 hours)

Data Link Layer: Design Issues, Framing – Error Control – Flow Control, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols, ARQ schemes, HDLC. PPP. Ethernet- IEEE 802.3,4,5 Protocols, Wireless LAN- the 802.11 Architecture and Protocol Stack-The 802.11 Physical Layer- The802.11 MAC Sub layer Protocol-The 805.11 Frame Structure-Services

UNIT – 3: MAC layer and routing algorithm (9 hours)

The Medium Access Control Sub layer-The Channel Allocation Problem-Static Channel Allocation-Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha-CSMA Protocols-Collision-Free Protocols, Need for Internetworking, Design Issues, Addressing, Internet Protocol (IPv4/IPv6), Virtual Circuit and Datagram Networks, Routing Algorithms, Congestion Control Algorithms.

UNIT –4: Transport layer (9 hours)

Transport layer: UDP, TCP, Congestion Control mechanisms, QOS, Techniques to improve QOS

UNIT – 5: Application layer (9 hours)

Application Layer: Cryptography and network security, DNS, Electronic Mail, FTP, HTTP, SNMP, DHCP.

TOTAL: 45 HOURS

Course Outcomes		POs related to COs
CO1	Independently understand basic computer network technology	PO1, PO2,PO3
CO2	Understand and explain Data Communications System and its components.	PO1, PO2, PO3,PO4
CO3	Analysis the different types of network topologies and protocols. And Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer	PO1, PO2,PO3,
CO4	Identify the different types of network devices and their functions within a network.	PO1, PO2,PO4
CO5	Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.	PO1,PO2,PO4

Text Books:

1. Computer Networks, Tanenbaum and David J Wetherall, 5th Edition, Pearson Edu, 2010
2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education.

Reference Books:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks - A Systems Approach" (5th ed), Morgan Kaufmann/ Elsevier, 2011
2. William Stallings, "Data & Computer Communication", Pearson Education India, 10th Edition, 2014.
3. James F. Kurose, Keith W. Ross, "Computer Networking: A Top–Down Approach Featuring the Internet", Pearson Education, 6th Edition, 2013.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	2	3	2	3	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	3	-	-	-	-	-	-	-	-
CO5	3	2	-	3	-	-	-	-	-	-	-	-
CO*	**2.8**	**2.6**	**2.3**	**3**	-	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18ECE419 **MICROPROCESSORS AND INTERFACING LAB**

Course Educational Objectives:
On successful completion of the course, students will be able

1 To demonstrate knowledge on 8086 Assembly Language programming Techniques.
2 To develop skill on Signed and Unsigned Arithmetic Operations.
3 To design different interfacing models of 8086 microprocessor
4 To understand various Logical Operations of 8086 microprocessor.
5 To apply different arithmetic operations using 8051 microcontroller

LIST OF EXPERIMENTS:

I MICROPROCESSOR 8086:

1. Introduction To MASM/TASM
2. Arithmetic Operation-Multisystem Addition and Subtraction, Multiplication and Division, Signed and Unsigned Arithmetic Operation, ASCII-Arithmetic Operations.
3. Logic Operations-Shift Rotate-Converting Packed BCD to Unpacked BCD, BCD to ASCII Conversion
4. By using string operation and instruction prefix: move block, reversestring, Sorting, inserting, deleting, length of string, string comparison.
5. DOS/BIOS programming: Display Characters, Strings

II INTERFACING

1. 8279-Keyboard display: write a small program to display a string of characters.
2. 8259- Interrupt controller: Generate an Interrupt using 8259
3. 8255-Interfacing with DAC to generate Triangular and Square waveform.
4. 8251- USART program to establish communication between two processors.

III MICROCONTROLLER 8051:

1. Arithmetic operations using 8051microcontroller(addition, subtraction, multiplication, division)
2. Reading and writing on parallel port

EQUIPMENT REQUIRED FOR LABORATORY:

1. 8086 MICROPROCESSOR KITS
2. 8051 MICROCONTROLLER KITS
3. INTERFACES/PERIPHERAL SUBSYSTEMS

a. 8259 PIC
b. 8279KB/DISPLAY
c. 8255 PPI
d. 8251 USART

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcome:

On successful completion of the course, Students will be able to		**POs related to COs**
CO1	To demonstrate knowledge on 8086 Assembly Language programming Techniques.	PO1
CO2	To develop skill on Signed and Unsigned Arithmetic Operations.	PO2
CO3	To design different interfacing models of 8086 microprocessor	PO5
CO4	To understand various Logical Operations of 8086 microprocessor.	PO8
CO5	To apply different arithmetic operations using 8051 microcontroller	PO9

CO-PO Mapping:

PO-CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	**-**	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	**-**	-	-	-	3	-	-	-	-	-	-	-
CO4	**-**	-	-	-	-	-	-	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	-	-	-
CO*	**3**	**3**			**3**			**3**	**3**			

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-I SEM (EEE)

L	T	P	C
3	1	0	3

SUB CODE: 18EEE415 POWER SYSTEMS AND SIMULATION LAB

Course Educational Objectives:
On successful completion of the course, students will be able

1 To study the modeling and parameter estimation of transmissions lines
2 To study the various methods used for solving load flow analysis
3 To study the stability, dynamics and transient analysis ofpower systems
4 To understand the concept of economic dispatch
5 To study the modeling, simulation and analysis of AVR.

Any 10 of following experiments

The following experiments are required to be conducted as compulsory experiments

1. Fault Analysis of **LG FAULT** on a Three-Phase Alternator.
2. Fault Analysis of **LL FAULT** on a Three-Phase Alternator.
3. Fault Analysis of **LLG FAULT** on a Three-Phase Alternator.
4. Fault Analysis of **LLLG FAULT** on a Three-Phase Alternator
5. Single Phase Earth Fault Relay
6. Single Phase Over Current Relay
7. Characteristics of Over Voltage Relay of Static Type
8. Equivalent Circuit of a Three Winding Transformer.
9. Power angle characteristics of salient pole synchronous Machine.

Any two of the following experiments are required to be conducted in addition to above.

1. Y-BUS Formation for a given Power System Line Data.
2. Z-BUS Formation for a given Power System Line Data
3. GAUSS-SEIDAL Load Flow Analysis for a given Power System Line Data and Load Data.
4. NEWTON-RAPHSON Load Flow Analysis for a given Power System Line Data and Load Data.
5. Reactive Power Compensation of Power System

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes:

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

Course Outcomes		POs related to COs
CO1	Understand power system planning and operational studies	PO1
CO2	Analyze and acquire knowledge on formation of Bus Admittance and Impedance Matrices and Solution of Networks	PO2
CO3	Design Bus Admittance and Impedance Matrices	PO3
CO4	Analyze and simulate the power flow using GS and NR method	PO5
CO5	Follow ethical principles to evaluate Symmetric and Unsymmetrical fault.	PO8
CO6	Do experiments effectively as an individual and as a member in a group.	PO9
CO7	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO8	Continue updating their skill related to electronic devices and their applications during their life time	PO12

Text Books:

1. Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata M Graw – Hill Publishing Company Ltd - 2nd edition.
2. Power System Analysis Operation and Control – A. Chakravarthi and S. Halder, 3rd Edition, PHI.
3. Electric Energy Systems by O I Elgerd - Mc Graw-hill Edition
4. Lab Manual of Power system simulation lab.

CO-PO MAPPING:

PO-CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**		**3**	**3**			**3**	**3**	**3**		**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-I SEM (EEE) | **L T P C**

PROFESSIONAL ETHICS | **3 0 0 0**

SUB CODE: 18AUD411 | **(Audit Course)**

Course Educational Objectives:

1. To develop the human values in work place, society and everywhere.
2. To understand the importance of engineering ethics with the mentors' theory on ethics
3. To inculcate codes of ethical values to the engineers in the society
4. To understand the ethical issues on safety, responsibilities and human rights in society.
5. To know the ethics issues on environmental, weapons, computers ethics & Moral leaderships.

UNIT - 1: HUMAN VALUES **(6hours)**

Morals, values and ethics – Integrity – Work Ethic –Honesty – courage – Empathy – Self-confidence – Character.

UNIT - 2: ENGINEERING ETHICS **(6 hours)**

Senses of 'Engineering Ethics' – Variety of moral issued – Types of inquiry – Moral dilemmas – Moral autonomy – Kohlberg's theory – Gilligan's theory – Consensus and controversy – Models of professional roles – Theories about right action – Self-interest – Customs and religion – Uses of ethical theories – Valuing time – Co-operation – Commitment.

UNIT - 3: ENGINEERING AS SOCIAL EXPERIMENTATION **(6 hours)**

Engineers as responsible experimenters – Codes of ethics – A balanced outlook on law – The challenger case study.

UNIT - 4: SAFETY, RESPONSIBILITY AND RIGHTS **(6 hours)**

Safety and risk – Assessment of safety and risk – Risk benefit analysis – The Three Mile Island and Chernobyl case studies.

UNIT - 5: GLOBAL ISSUES **(6 hours)**

Multinational corporations – Environmental ethics - Computer ethics – Weapons development – Engineers as managers – Engineers as expert witnesses and advisors – Moral leadership.

TOTAL: 30 HOURS

Course Outcomes:

After the completion of this course, a successful student is able to		**POs related to COs**
CO1	Develop the human values in work place, society and everywhere.	PO6,PO8,PO9, PO11,PO12
CO2	Understand the importance of engineering ethics with the mentors' theory on ethics	PO6,PO8,PO9, PO11,PO12
CO3	Inculcate codes of ethical values to the engineers in the society	PO6,PO8, PO12
CO4	Understand the ethical issues on safety, responsibilities and human rights in society.	PO6,PO8,PO9, PO12
CO5	Know the ethics issues on environmental, weapons, computers ethics & Moral leaderships	PO6,PO7,PO8,PO9

Text books:

1. A Textbook on Professional Ethics and Human Values, 1/e, 2006, Naagarazan R.S., New Age International (P) Ltd, Publishers, New Delhi.
2. Professional Ethics and Human Values, S. Dinesh Babu, Laxmi Publications (P) Ltd, New Delhi.

Reference books:

1. Engineering Ethics, 2004, M. Govindarajan, S. Natarajan, V.S.Senthil Kumar, Prentice - Hall of India, Pvt. Ltd., and New Delhi.
2. Engineering Ethics, 2004, Charles D. Fleddermann, Pearson Education/ Prentice- Hall, New Jersey (Indian reprint now available).
3. Engineering Ethics- Concepts and Cases, 2000, Charles E Harris, Michael S. Protchard and Michael J Rabins, Wadsworth Thompson Leaning, United States (Indian reprint now available).
4. Ethics in Engineering, Mike Martine and Roland Schinzinger, Tata McGraw- Hill Education, Pvt. Ltd.,Noida.
5. Ethics and the Conduct of Business, 2003, John R Boatright, Pearson Education, New Delhi.
6. Fundamentals of Ethics for Scientists and Engineers, 2001, Edmund G Seebauer and Robert L Barry, Oxford University press, Oxford.

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	3	2	-	1	2
CO2	-	-	-	-	-	2	-	3	2	-	1	2
CO3	-	-	-	-	-	3	-	3	-	-	-	2
CO4	-	-	-	-	-	2	-	3	2	-	-	2
CO5	-	-	-	-	-	2	2	3	2	-	-	-
CO*	**-**	**-**	**-**	**-**	**-**	**2.2**	**2**	**3**	**2**	**-**	**1**	**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE421 CONTROL OF ELECTRICAL DRIVES

Course Educational Objectives:
On successful completion of the course, students will be able to

1 To understand the knowledge on dynamics of electrical drives
2 To apply the skill on operation and speed control of DC drives
3 To study the different speed control methods of various induction motor drives
4 To study the skills on operation and speed control of AC drives
5 To develop the skills on design of controllers for drives.

Unit I Introduction to Electrical Drives (9hours)

Concept of electrical drives – dynamics of electrical drives - fundamental torque equations, speed-torque conventions and multi quadrant operation – steady state stability - typical load torque characteristics – Selection of motor- Electric braking methods regenerative dynamic and plugging.

UNIT II Converter / Chopper Fed DC Motor Drive (9hours)

Steady state analysis of the single and three phase converter fed separately excited DC motor drive– continuous conduction –Time ratio and current limit control – 4 quadrant operations of converter / chopper fed drive-Applications.

Unit III Induction Motor Drives (9hours)

Stator voltage control–V/f control– Rotor Resistance control-qualitative treatment of slip power recovery drives-closed loop control–– vector control- Applications.

UNIT IV Synchronous Motor Drives (9hours)

V/f control and self-control of synchronous motor: Margin angle control and power factor control .Three phase voltage/current source fed synchronous motor- Applications.

UNIT V Design of Controllers for Drives (9hours)

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 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Ability to understand operation and dynamics of electrical drives	PO1,PO2
CO2	Ability to understand converter control of various DC drives	PO1,PO2
CO3	Ability to understand various control strategies for Induction Motor Drive systems	PO1,PO2
CO4	Ability to understand various control strategies for Synchronous Motor Drive systems	PO1,PO2
CO5	Ability to understand design of controllers for drives.	PO1,PO2,PO3,PO12

Text Books:

1. Fundamentals of Electric Drives , 2/e 2001 , G K Dubey , Tata McGraw – Hill Education Pvt. Ltd.. Noida
2. Modern Power Electronics and AC drives , 1/e 2002, B.K Bose , Pearson Publications–India.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Pearson, 2001

Reference Books:

1. Thyristor Control of Electric drives , 1/e2008, VedamSubramanyam ,Tata McGraw – Hill Education Pvt. Ltd. Noida.
2. Power Semiconductor Drives, 1/e 2009 ,S. Sivanagaraju , H. Balasubbareddy and A. Mallikarjuna Prasad , PHI Learning Pvt Ltd – New Delhi.
3. Electrical Motors & Drives Fundamentals, Types and Applications , 4/e 2013 , Austin Huges and Bill Drury, Newnes publications –New Delhi.
4. Power Electronics, 2/e 2007 (3rd Reprint 2008) , M. D. Singh and K. B. Khanchandani ,Tata McGraw – Hill Education Pvt. Ltd. – New Delhi.
5. Power Electronics Circuits, Devices and Applications , 3/e 2004 , Mohammad H. Rashid , Dorling KinderslyPvt Ltd – New Delhi.

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3	-	-	-	-	-	-	-	-	2
CO*	**3**	**2.6**	**3**									**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE422 POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS

Course Educational Objectives:
On successful completion of the course, students will be able to

1	Provide knowledge about the stand alone and grid connected renewable energy systems.
2	Equip with required skills to derive the criteria for the design of power converters for renewable energy applications
3	Analyze and comprehend the various operating modes of wind electrical generators and for solar energy system.
4	Design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy applications
5	Develop maximum power point tracking algorithms

Unit I: Introduction **(9hours)**

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

Unit II: Electrical Machines for Renewable Energy Conversion **(9hours)**

Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

Unit III: Power Converters **(9hours)**

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

Unit IV: Analysis of Wind and PV Systems **(9hours)**

Stand alone operation of fixed and variable speed wind energy conversion systems and solar system Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system

Unit V: Hybrid Renewable Energy Systems **(9hours)**

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be		POs related to COs
CO1	Able to understand power system operation	PO1,PO2,,PO4
CO2	Able to analyze the energy conversion schemes.	PO1,PO2,PO3
CO3	Able to understand stability and control	PO1,PO2,PO4
CO4	Able to analyze wind and PV systems.	PO1,PO2,PO3
CO5	Able to handle the engineering aspects of electrical energy generation and utilization	PO1,PO3,PO4

Text Books:

1. S. N. Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
2. B.H.Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company, New Delhi, 2009.

Reference Books:

1. Rashid .M. H "power electronics Hand book", Academic press, 2001.
2. Ion Boldea, "Variable speed generators", Taylor & Francis group, 2006.
3. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.
4. Gray, L. Johnson, "Wind energy system", prentice hall linc, 1995.

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	3	-	-	-	-	-	-	-	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-
CO3	2	2	-	3	-	-	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	2	-	3	3	-	-	-	-	-	-	-	-
CO*	**2**	**2**	**3**	**3**								

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

CORE ELECTIVE -III

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE423A UTILIZATION OF ELECTRICAL ENERGY

Course Educational Objectives:
On successful completion of the course, students will be able to

1	Understand the principle, design of illumination systems and energy efficiency lamps.
2	Study the different methods of Electric heating and welding
3	Understand the electric traction systems and Electric Braking.
4	To study about the Calculations of tractive effort and Specific energy consumption.
5	To Study about the Power Factor Improvement and Economic Aspects in Utilizing Electrical energy

Unit -I: Illumination (9 hours)

Introduction - Terms used in illumination **-**Laws of illumination - Polar curves - Photometry - Sources of light - Lamps: Incandescent lamps - Discharge lamps - SV and MV lamps - Lighting schemes- Requirement of good lighting scheme –Types and design of lighting schemes - calculation of illumination-Numerical problems.

Unit -II: Electric Heating and Welding (9 hours

Electric Heating- Advantages and methods of electric heating - Resistance heating - Arc heating - Induction heating and dielectric heating - Infrared or radiant heating - power factor correction on utility. **Electric Welding- Electric Welding-** Definition of welding - Welding process - Resistance and arc welding – electric welding equipment, comparison between AC and DC welding

Unit -III: Electric Traction-I (9 hours)

Introduction- Systems of electric traction - Comparison between A.C. and D.C. traction - Special features of traction motor- Methods of electric braking- Rheostat braking and regenerative braking - Speed-time curves for different services – Trapezoidal and quadrilateral speed time curves - Numerical problems.

Unit -IV: Electric Traction-II (9 hours)

Mechanics of train movement- Adhesive weight and coefficient of adhesion – Problems - Calculations of tractive effort - Power - Specific energy consumption - Factors affecting specific energy consumption of an electric train operating on a given schedule - Control of traction motors.

Unit -V: Economic Aspects of Utilizing Electrical Energy (9 hours)

Power Factor Improvement, Load Factor improvement, Off Peak Loads- Use of Exhaust Steam, Waste Heat recovery, Pit Head Generation, Diesel Plant, General Comparison of Private Plant and Public Supply- Initial Cost and Efficiency, Capitalization of Losses, Choice of Voltage.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Acquire knowledge on Laws of illumination and Lighting schemes	PO1,PO3,PO7,PO12
CO2	Able to identify most appropriate heating or welding techniques for suitable applications.	PO1,PO3, PO4, PO7, PO12
CO3	To understand the concepts Electric traction systems and Electric braking	PO1,PO3, PO4, PO7, PO12
CO4	To Analyze the Mechanics of train movement and Specific Energy Consumption	PO1,PO3, PO4, PO7, PO12
CO5	To Understand the Economic Aspects Of Utilizing Electrical energy	PO1,PO3, PO7, PO12

Text Books:

1. Utilization of Electrical Energy, 1/e 2007 ,Open Shaw Taylor , Orient Longman- Hyderabad.
2. Utilization of Electric power, 1/e 2006 ,R K Rajput , Lakshmi Publications – New Delhi.
3. Electrical Power, S. L. Uppal, Khanna pulishers, 1988.

Reference Books:

1. Utilization of Electric power and Electric traction , 10 /e 2009 J B Gupta , S K kataria andsons Publications – New Delhi.
2. Utilization of Electrical Energy ,1/e 2010,Tarlok Singh, S. K. Kataria and Sons - NewDelhi.
3. Generation & Utilization of Electrical Energy , 1/e 2010,S. Sivanagaraju, M. Balasubba Reddy and D. Srilatha , Dorling Kindersly.Pvt Ltd – UP, INDIA.
4. Utilization of Electrical Power Including Electrical Power &Electric Traction ,1/e 1994, N.V. Suryanarayana ,New Age Publications – New Delhi.

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	-	-	2	-	-	-	-	2
CO2	3	-	3	3	-	-	2	-	-	-	-	2
CO3	3	-	3	2	-	-	2	-	-	-	-	3
CO4	3	-	3	2	-	-	2	-	-	-	-	3
CO5	3	-	2	2	-	-	2	-	-	-	-	2
CO*	**2**		**2.6**	**2.25**			**2**					2

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE423B **SMART GRID**

Course Educational Objectives:
On successful completion of the course, students will be able to

1. Know the technologies for smart grid
2. Appreciate the smart transmission as well distribution systems
3. Realize the distribution Technology
4. Acquire knowledge on generation and smart consumption
5. Demonstrate knowledge on regulations and market models for smart grid

UNIT -I: Introduction to Smart Grids (9 hours)

Definition, justification for smart grids, smart grid conceptual model, smart grid architectures, Interoperability, communication technologies, role of smart grids standards intelligrid initiative, national smart grid mission (NSGM) by Govt. of India

UNIT -II: Smart Transmission Technologies (9 hours)

Substation automation, Supervisory control and data acquisition (SCADA), energy management system (EMS), phasor measurement units (PMU), Wide area measurement systems (WAMS)

UNIT -III: Smart Distribution Technologies (9 hours)

Distribution automation, outage management systems, automated meter reading (AMR), automated metering infrastructure (AMI), fault location isolation and service restoration (FLISR), Outage Management Systems (OMS), Energy Storage, Renewable Integration

UNIT -IV: Distributed Generation and Smart Consumption (9 hours)

Distributed energy resources (DERs), smart appliances, low voltage DC (LVDC) distribution in homes / buildings, home energy management system (HEMS), Net Metering, Building to Grid B2G, Vehicle to Grid V2G, Solar to Grid, Micro grid

UNIT -V: Regulations and Market Models for Smart Grid (9 hours)

Demand Response, Tariff Design, Time of the day pricing (TOD), Time of use pricing (TOU), Consumer privacy and data protection, consumer engagement etc. Cost benefits analysis of smart grid projects.

TOTAL: 45 Hours

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand technologies for smart grid	PO1,PO2
CO2	Appreciate the smart transmission as well distribution systems	PO1,PO2
CO3	Realize the distribution Technology	PO1,PO2
CO4	Acquire knowledge on generation and smart consumption	PO1,PO2, PO3
CO5	Demonstrate knowledge on regulations and market models for smart grid	PO1,PO2,PO3

Text Books:

1. Clark W Gellings, "The Smart Grid, Enabling Energy Efficiency and Demand Side Response"- CRC Press, 2009.
2. Jean Claude Sabonnadière, Nouredine Hadjsaïd, "Smart Grids", Wiley-ISTE, IEEE Press, May 2012

References:

1. Janaka Ekanayake, Kithsiri Liyanage, Jianzhong. Wu, Akihiko Yokoyama, Nick Jenkins, "Smart Grid: Technology and Applications"- Wiley, 2012.
2. James Momoh, "Smart Grid: Fundamentals of Design and Analysis" – Wiley, IEEE Press, 2012.
3. India Smart Grid Knowledge Portal.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	**-**	-	-	-	-	-	-	-	-	-
CO2	3	3	**-**	-	-	-	-	-	-	-	-	-
CO3	3	3	**-**	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.8**	**2**									

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE423C FLEXIBLE AC TRANSMISSIONSYSTEMS

Course Educational Objectives:
On successful completion of the course, students will be able to

1 understand the need for FACTS
2 learn shunt compensation techniques
3 Know the series compensation techniques
4 understand the concept of unified power flow controller
5 learn about controlled voltage and Phase angle regulator

Unit -I: Introduction (9 hours)

Electrical transmission network – Need of transmission interconnections – power flow in AC systems – power flow and dynamic stability considerations – Relative importance of controllable parameters – Basic types of FACTS controllers Brief description && definitions – Benefits from FACTS technology.

Unit -II: Static VAR Compensator (SVC) (9 hours)

Introduction to shunt compensation – Objectives of Shunt compensation –Voltage control by SVC – VI characteristics – advantages of slope in dynamic characteristics – Influence of SVC on system voltage, SVC applications: Steady state power transfer capacity – enhancement of transient stability – Prevention of voltage instability – Introduction to PODC.

Unit -III: Thyristors Controlled Series Capacitor (TCSC) (9 hours)

Introduction to series compensation – Objectives of series compensation –Operation of TCSC: Different modes of operation – Modeling of TCSC: variable reactance model, Transient stability model – TCSC applications: Improvement of system stability limit –voltage collapse prevention.

Unit IV: Emerging Facts Controllers (9 hours)

Basic concept of voltage source converters and current source converter SSSC – principle of operation – Applications, STATCOM – principle of operation –VI characteristics – Applications – UPFC: - Modes of operation – Applications –Introduction to IPFC – Comparison of SVC and STATCOM.

Unit -V: Static Voltage and Phase Angle Regulator **(9 hours)**

Objectives of voltage and phase angle regulators –– Approaches to thyristor controlled voltage and phase angle regulators – Industrial applications of FACTS devices.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	To understand the need for FACTS	PO1,PO2,PO3,PO12
CO2	To learn shunt compensation techniques	PO1,PO2
CO3	To learn series compensation techniques	PO1,PO2,PO3
CO4	To learn the concept of unified power flow controller	PO1,PO2,PO3
CO5	To learn about controlled voltage and Phase angle regulator	PO1,PO3

Text Books:

1. Narain G.Hingorani and Laszl Gyugyi, "Understanding FACTS – Concept & technology of flexible AC transmission systems", Standard publishers distributors, IEEE press,2001.
2. Padiyar.K.R," FACTS Controllers in Power Transmission and Distribution",NewAge International (P) Limited, Publishers, New Delhi, 2008.

Reference Books:

1. Mohan. R.Mathur & Rajiv K. Varma, "Thyristor – Based FACTS controllers for Electrical transmission systems", Wiley Inter science publications, 2002.
2. Enrique Acha, Claudio R.Fuerte, Esquivel, Hygo Ambriz, Perez & Cesar Angeles –Camacho, "FACTS – Modeling and Simulators in Power Networks", John wiley & sons,2004.
3. John. A.T. "Flexible AC transmission systems", Institution of Electrical and Electronics Engineers, IEEE press, 1999.

CO-PO Mapping:

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	3
CO2	3	3	-	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
CO3	3	3	3	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	3	3	3	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	3	-	3	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	-
CO*	**3**	**3**	**3**									3

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE423D ELECTRICAL MACHINE DESIGN

Course Educational Objectives:
On successful completion of the course, students will be able to

1	To discuss the properties of electrical, magnetic and insulating materials used in the design of electrical machines.
2	To understand the design of DC machine rotor and stator
3	To derive the output equation of transformers, loading effect on conductors, and cooling methods
4	To learn the design aspects of different parts of Induction motor
5	To discuss the loading effect, and design of salient pole synchronous machine

Unit I: Fundamental Aspects of Electrical Machine Design (9 hours)

Design of Machines, Design Factors, Limitations in design, Modern Trends in design, manufacturing Techniques.

Electrical Engineering Materials: Desirability's of Conducting Materials, Comparison of Aluminium and Copper wires. Ferromagnetic Materials: Soft Magnetic materials – Solid Core Materials, Electrical Sheet and Strip, Cold Rolled Grain Oriented Steel. Insulating Materials: Desirable Properties, Temperature Rise and Insulating Materials, Classification of Insulating materials based on Thermal Consideration.

Unit - II: Design of DC Machines (9 hours)

Output Equation, Choice of Specific Loadings and Choice of Number of Poles, Main Dimensions of armature, Design of Armature Slot Dimensions, Commutator and Brushes. Estimation of Ampere Turns for the Magnetic Circuit. Dimensions of Yoke, Main Pole and Air Gap. Design of Shunt and Series Field Windings.

Unit - III: Design of Transformers (9 hours)

Output Equations of Single Phase and Three Phase Transformers, Choice of Specific Loadings, Expression for Volts/Turn, Determination of Main Dimensions of the Core, Estimation of Number of Turns and Conductor Cross Sectional area of Primary and Secondary Windings, No Load Current. Expression for the Leakage Reactance of core type transformer with concentric coils, and calculation of Voltage Regulation. Design of Tank and Cooling (Round and Rectangular) Tubes.

Unit - IV: Design of Three Phase Induction Motors (9 hours)

Output Equation, Choice of Specific Loadings, Main Dimensions of Stator. Design of stator slots and Winding, Choice of Length Air Gap, Estimation of Number of Slots for Squirrel Cage Rotor. Design of Rotor Bars and End Ring. Design of Slip Ring rotor. Estimation of No Load Current and Leakage Reactance.

Unit - V: Design of Three Phase Synchronous Machines **(9 hours)**

Output Equation, Choice of Specific Loadings, Short Circuit Ratio, Main Dimensions of Stator. Design of stator slots and Winding. Design of Salient and non- salient Pole Rotors. Magnetic Circuit and Field Winding.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Demonstrate knowledge on electrical machine parameters, and electrical engineering materials.	PO1, PO3
CO2	Acquire knowledge on design of DC motor	PO1,PO2,PO3,PO 4, PO12
CO3	Demonstrate knowledge on construction of inner parts of transformer.	PO1,PO2,PO3,PO 4, PO12
CO4	Acquire knowledge on design of induction motor for given specifications.	PO1,PO2,PO3,PO 4, PO12
CO5	Demonstrate knowledge on short circuit ratio and its effects on performance of synchronous machine, and Design salient pole and non- salient pole alternators for given specifications.	PO1,PO2,PO3,PO 4, PO12

Text Books:

1. A course in Electrical Machine design By A.K.Sawhney, DhanpatRai Publication, 6th Edition, 2013

Reference Books:

1. Performance and Design of Alternating Current Machines by M.G. Say , CBS Publisher, 3rd Edition, 2002
2. Design Data Handbook A. Sanmugasundaram Et al New Age International 1st Edition, 2011

CO-PO Mapping:

CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	2	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	3	2	3	2	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	3	2	3	2	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	3	2	3	2	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	3	2	3	2	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO*	**3**	**2**	**2.8**	**2**								**3**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE423E **POWER SYSTEM TRANSIENTS**

Course Educational Objectives:
On successful completion of the course, students will be able to

1	Study the generation of switching transients and their control using circuit theoretical concept.
2	Study the mechanism of switching transients and their adverse effects.
3	Study the mechanism of lighting strokes and the production of lighting surges.
4	Study the propagation, reflection and refraction of travelling waves.
5	Study the impact of voltage transients caused by faults, circuit breaker action, and load rejection on integrated power system.

Unit -I: Introduction and Survey **(9 hours)**

Review and importance of the study of transients – causes for transients. RL circuit transient with sine wave excitation – double frequency transients – basic transforms of the RLC circuit transients. Different types of power system transients – effect of transients on power systems- role of the study of transients in system planning.

Unit -II: Switching Transients **(9 hours)**
Over voltages due to switching transients – resistance switching and the equivalent circuit for interrupting the resistor current – load switching and equivalent circuit – waveforms for transient voltage across the load and the switch – normal and abnormal switching transients. Current suppression – current chopping– effective equivalent circuit. Capacitance switching – effect of source regulation – capacitance switching with a restrike, with multiple restrikes.

Unit -III: Lightning Transients **(9 hours)**

Review of the theories in the formation of clouds and charge formation – rate of charging of thunder clouds – mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke – factors contributing to good line design – protection using ground wires – tower footing resistance – interaction between lightning and power system.

Unit- IV: Traveling Waves on Transmission Line **(9 hours)**

Computation of transients – transient response of systems with series and shunt lumped parameters and distributed lines. Traveling wave concept – step response – Bewley's lattice diagram – standing waves and natural frequencies – reflection and refraction of travelling waves.

Unit -V: Transients in Integrated Power System **(9 hours)**
The short line and kilometric fault – distribution of voltages in a power system – line dropping and load rejection – voltage transients on closing and reclosing lines – over voltage induced by faults – switching surges on integrated system – Quantitative application of EMTP for transient computation.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Study the generation of circuit transients and their control using circuit– theoretical concept.	PO1, PO2, PO4
CO2	Acquire knowledge on switching transients and their adverse effects.	PO1,PO2, PO4
CO3	Acquire knowledge on lighting strokes and the production of lighting surges	PO1,PO3
CO4	Understands wave propagation, reflection and refraction of travelling waves	PO1,PO2, PO3
CO5	know the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system	PO1,PO2,PO3,PO4

Text Books:

1. Allan Greenwood, "Electrical transients in Power systems", Wiley Inter Science, New York, 2^{nd} Edition, 1991.
2. Pritindra Chowdhari, "Electromagnetic transients in power systems", John Wiley and Sons, 2^{nd} Edition, 2009.
3. C.S. Indulkar, D.P.Kothari, K.Ramalingam, "Power system Transients – A statistical approach", PHI Learning Private Limited, 2^{nd} Edition, 2010.

Reference Books:

1. M.S.Naidu and V.Kamaraju, "High voltage engineering", TMH, 5^{th} Edition, 2013.
2. R.D. Begamudre, "Extra high voltage AC transmission engineering", Wiley Eastern Ltd,.1986.
3. Y.Hase, "Handbook of power system engineering", Wiley India, 2102.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	3	-	-	-	-	-	-	-	-
CO2	3	2	-	2	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**2.5**	**2.3**	**2.3**								

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE423F PROGRAMMABLE LOGIC CONTROLLERS AND APPLICATIONS

Course Educational Objectives:
On successful completion of the course, students will be able to

1. Have knowledge on PLC.
2. Acquire the knowledge on programming of PLC.
3. Understand different PLC registers and their description.
4. Have knowledge on data handling functions of PLC.
5. Know how to handle analog signal and converting of A/D in PLC.

Unit -I: Introduction (9 hours)

PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming Equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

Unit -II: PLC PROGRAMMING (9 hours)

PLC Programming: Input instructions, outputs, operational procedures, programming Examples using contacts and coils. Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams and sequence listings, ladder diagram construction.

Unit -III: PROGRAMMABLE TIMERS AND COUNTERS (9 hours)

Timer instructions – On delay time instruction – Off delay timer instruction – Retentive timer– Counter instructions – Up counter – Down counter - Cascading counters – Incremental encoder – Counter applications – Combining counter and timer functions.

Unit -IV: PROGRAM CONTROL INSTRUCTIONS (9 hours)

Master control reset instruction – Jump instructions and sub routines – Immediate input and output instructions.

Unit -V: OTHER INSTRUCTIONS (9 hours)

Data manipulation – Data transfer operation – Data compare instruction – Data manipulation programs – Numerical data I/O interfaces – Math instructions – Addition, subtraction, multiplication & division instruction – Sequential instructions – Sequence programs – Shift registers – Word shift registers

TOTAL: 45 Hours

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	To Understand the PLCs and their I/O modules.	PO1,PO2,PO3,PO4
CO2	To develop control algorithms to PLC using ladder logic.	PO1,PO2,PO3,PO4
CO3	To Manage PLC registers for effective utilization in different applications.	PO1,PO2, PO3
CO4	To Design PID controller with PLC.	PO1,PO2,PO4
CO5	To Apply the conceptual knowledge of different sequential instructions	PO1,PO2,PO12

Text Books:

1. Programmable logic controllers by Frank D.Petruzella- McGraw Hill – 3rd Edition.
2. Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI

Reference Books:

1. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.
2. Introduction to Programmable Logic Controllers- Gary Dunning-CengageLearning. Programmable Logic Controllers –W.Bolton-Elsevier publisher

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	3	-	**2**	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**2.4**	**2**	**2**								**3**

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CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

CORE ELECTIVE -IV

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE424A **INDUSTRIAL AUTOMATION**

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Acquire familiarity about various industrial instrumentation parameters.
2 Understand the open loop and closed loop control systems
3 Learn about industrial PLC, DCS, SCADA and its applications.
4 Impart fundamental knowledge on Networking Communication and Protocols
5 Understand the application of PLC, SCADA.

Unit -I: Introduction to Industrial Automation (9 hours)
Measurement of Process Parameters, Pressure, Temperature, flow, level, Displacement and Speed, Virtual Instrumentation and Data Acquisition System

Unit II: Fundamentals of Automatic Process Control (9 hours)
Need for process control , I/P, P/I converters ,basic Control elements, open loop and closed loop control systems, Set point, Valve positioned and its importance , Pneumatic and electronic control valves,, Solenoid Value, Actuators, Relays and Contactors.

Unit -III: Introduction to PLC and DCS (9 hours)
Introduction to Programmable Logic Controllers ,Overview, functions & features, typical areas of applications, Concept of DCS, advantages and limitations of DCS, Comparison of PLC and DCS

Unit -IV: Introduction to SCADA and HMI (9 hours)
Introduction to SCADA, Different Systems in SCADA like Field Instrumentation, Remote terminal unit(RTU), Master terminal Unit (MTU), Human machine Interface (HMI), Need, Advantages – HMI real time application for industry process-Evolution.

Unit -V: Industrial Applications: (9 hours)
Applications of PLC and SCADA in Marine and petrochemical process industry.

TOTAL: 45 Hour

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Outline the basic needs of an industry requirement	PO1,PO2,PO3,PO12
CO2	Ability to select sensors and transducers according to the applications	PO1,PO2,PO3,PO12
CO3	Understand the various control Elements.	PO1,PO2,PO3,PO12
CO4	Illustrate the concepts of SCADA for Industrial applications	PO1,PO2,PO3,PO12
CO5	Study PLC and DCS for Industrial applications	PO1,PO2,PO3,PO12

Text Books

1. C.D.Johnson, Process Control Instrumentation, Prentice Hall India Learning PrivateLimited
2. D. Patranabis, 'Principles of Industrial Instrumentation', Tata McGraw Hill Publishing Company Ltd, 1996.

References

1. Industrial Instrumentation, Control and Automation, S. Mukhopadhyay, S. Sen and A. K. Deb,
2. Jaico Publishing House, 2013
3. Doeblin: Measurement Systems: Application and Design, TMH
4. Industrial Instrumentation, Control and Automation, S. Mukhopadhyay, S. Sen and A. K. Deb, Jaico Publishing House, 2013

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	**2**
CO3	3	2	2	-	-	-	-	-	-	-	-	**2**
CO4	3	2	**2**	-	-	-	-	-	-	-	-	**2**
CO5	3	2	**2**	-	-	-	-	-	-	-	-	2
CO*	**3**	**2**	**2**									**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE:18EEE424B **ELECTRICAL DESIGN SYSTEMS**

Course Educational Objectives:

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

1 Fundamental concepts of electric wiring, Design Aspects of Lighting and Pre-commissioning.
2 Study the classification of Industrial Installations
3 Study power factor improvement and different types of earthing
4 Study Power quality issues
5 Study energy economics in system design

Unit -I: Design Aspects of Electrical Systems (9 hours)

Role of Statutes in Electrical System Design - Classification of Building Services - Design Aspects of Lighting - Design Aspects of Ventilation - Design Aspects of Climate Control - Design Aspects of Vertical Transportation - Design Aspects of Minor Building Services. Classification - Estimation of Load Requirements - Selection of Type of Wiring - Special Features Applicable for High-Rise Apartment Buildings - Pre-commissioning Tests.

Unit -II: Industrial Installations (9 hours)

9 hours

Classification of Industrial Installation - General Characteristics - Selection of Distribution Architecture - Selection of Transformers and Sub Stations .Short Circuit Studies - Fault Current Calculations - Earthing Design - Selection of Switch Gears: Electrical Protection - Protection of Circuit Elements - Persons & Life stack - Equipment - Electrical Isolation - Switch Gear Control - Switching Devices - Uses - Selective Co-ordination - Circuit Breakers and Their Selection.

Unit -III: Power Factor Improvement &Power System Earthing (9 hours)

Power Factor Improvement: Nature of Reactive Energy - Power Factor - How to Improve Power Factor? - Economics of Power Factor Improvement - Location of Capacitors - Installation Precautions - Optimal Compensation - PF Correction of Induction Motors - Protection and Control - Voltage Transients - Switching Considerations.

Power System Earthing: Earthing - Types of System Earthing - Reasons for Grounding/ Earthing - TN System - TT System - IT System - Protective Measures and Protective Devices in IT System - Main Characteristics of Earthing Systems - Selection Criteria for Earthing - Design Considerations of Earting - Measurement of Earth Resistance - Earth Leakage Protection - Neutral Earthing for Generators and Transformers. Lighting protection systems

Unit -IV: Power Quality Issues and Resonance Problems in Systems Design (9 hours)

Power Quality Issues - Harmonics - Sources of Harmonics - Disturbances Caused by Harmonics - Methods to reduce the Impact of Harmonics - Design the Detuned Capacitor Bank - IEEE Standard 519- 1992 and Limits

Unit -V: Energy Economics in System Design (9 hours)

Introduction - Time Value of Money - Single Payment Compound Amount Model (SPCA) - Uniform Series Compound Amount Model (USCA) - Uniform Series Present Worth Model (USPW) - Depreciation - Tax Considerations - After Tax Analysis.

TOTAL:45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Apply electrical design and installation concepts.	PO1,PO3,PO6
CO2	Acquire knowledge on Industrial Installations and Protection.	PO1,PO3,PO6
CO3	Understand various types of power factor improvement and Power system earthing	PO1,PO3,PO6,PO12
CO4	Understand the power quality Issues	PO1,PO3,PO6,PO12
CO5	Understand energy economics in power system design	PO1,PO3,PO6,PO12

Text Book:

1. Electrical Systems Design – by M. K. Giridharan - I. K. International Publishing House Pvt.Ltd.
2. Design of Electrical Installations – by Er. V. K. Jain and Er. Amitabh Bajaj - UniversityScience Press.

Reference Books:

1. Electrical Power system design, 1/e ,2001,by M.V.Deshpande Tata McGraw – Hill Education Pvt. Ltd.. NewDelhi.
2. Efficient Electrical system Design 1/e 2008,Harry Franz, Albert Thumann Fairmont Press – USA.
3. Design of Electrical systems for Large Projects, 1/e 1991,Balasubramanyan,The Rukmini Studies– NewDelhi.

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	2	-	-	-	-	-	-
CO2	3	-	3	-	-	3	-	-	-	-	-	-
CO3	3	-	3	-	-	2	-	-	-	-	-	2
CO4	3	-	3	-	-	3	-	-	-	-	-	2
CO5	3	-	2	-	-	3	-	-	-	-	-	2
CO*	**3**		**2.8**			**2.6**						**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE424C **MICROCONTROLLER BASED SYSTEM DESIGN**

Course Educational Objectives:

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

1 Introduce the architecture of PIC microcontroller
2 Educate on use of interrupts and timers
3 Educate on the peripheral devices for data communication and transfer
4 Introduce the functional blocks of ARM processor
5 Educate on the architecture of ARM processors

Unit -I: Introduction to PIC Microcontroller **(9 hours)**

Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–PIC16cxx–-Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressing modes – Simple Operations.

Unit -II: Interrupts and Timer **(9 hours)**

PIC micro controller Interrupts- External Interrupts-Interrupt Programming–Loop time subroutine - Timers-Timer Programming– Front panel I/O-Soft Keys– State machines and key switches– Display of Constant and Variable strings.

Unit -III: Peripherals and Interfacing **(9 hours)**

I2C Bus for Peripherals Chip Access– Bus operation-Bus subroutines– Serial EEPROM-Analog to Digital Converter–UART-Baud rate selection–Data handling circuit–Initialization - LCD and keyboard Interfacing -ADC, DAC, and Sensor Interfacing.

Unit -IV: Introduction to Arm Processor **(9 hours)**

ARM Architecture –ARM programmer's model –ARM Development tools- Memory Hierarchy –ARM Assembly Language Programming–Simple Examples–Architectural Support for Operating systems.

Unit -V: ARM Organization **(9 hours)**

3-Stage Pipeline ARM Organization– 5-Stage Pipeline ARM Organization–ARM Instruction Execution- ARM Implementation– ARM Instruction Set– ARM coprocessor interface– Architectural support for High Level Languages – Embedded ARM Applications.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on PIC Microcontroller.	PO1,PO2
CO2	Acquire knowledge on interrupt.	PO1,PO2
CO3	Demonstrate knowledge on peripheral devices for data communication and transfer	PO1,PO2, PO3
CO4	Acquire knowledge on the functional blocks of ARM processor	PO1,PO2
CO5	Demonstrate knowledge on architecture of ARM processors	PO1,PO2

Text Books:

1. Peatman,J.B., "Design with PIC Micro Controllers"PearsonEducation,3rdEdition, 2004.

Reference:

1. Mazidi, M.A.,"PIC Microcontroller" Rollin Mckinlay, Danny causey Printice Hall of India, 2007
2. Furber,S., "ARM System on Chip Architecture" Addison Wesley trade ComputerPublication, 2000.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.8**	**2**									

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE:18EEE424D **ADVANCED POWER SEMICONDUCTOR DEVICES**

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Understand the construction and working of BJT
2 Understand the construction and working of power MOSFET
3 Acquire knowledge on characteristics of GTO, and IGBT
4 Know recent family of power switches.
5 Design driver circuits of different power switches

Unit -I: Power BJTS **(9 hours)**

Vertical power transistor structures-I-V characteristics-Physics of BJT operation switching characteristics-Break down voltages-Second break down-On-state losses-Safe operation areas.

Unit -II: Power MOSFETS9hours **(9 hours)**

Basic structures- I-V characteristics-Physics of device operation-Switching characteristics-Operation limitations and safe operating areas.

Unit -III: Gate Turn-Off Thyristors & IGBT'S9hours **(9 hours)**

GTOs-Basic structures-I-V characteristics-Physics of device operation-GTO switching characteristics - Over current protection of GTOs.IGBTs-Basic structures-I-V characteristics-Physics of device operation-Latch in IGBTs-Switching characteristics-Device limits and safe operating areas.

Unit -IV: Emerging Devices and Circuits **(9 hours)**

Introduction-Power junction field effect transistors-Field controlled Thyristor-JFET based devices - MOS controlled Thyristors - New semiconductor materials

Unit -V: Gate Drive Circuits. **(9 hours)**

MOSFET gate drive – BJT base drive – IGBT base drive-Thyristor firing circuits-Thyristor converter gating circuits.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on characteristics of BJTs	PO1, PO2PO3,PO4
CO2	Acquire knowledge on Working of power MOSFETs	PO1,PO2,PO3,PO4
CO3	Acquire knowledge on recent power switches	PO1,PO2,PO3,PO4
CO4	Acquire knowledge on operation of GTO, and IGBT	PO1,PO2,PO3,PO12
CO5	Acquire knowledge on design of gating circuits of switches	PO1,PO2,PO4

Text Books:

1. "Power Electronic Circuits, Devices and Applications" – 3rd Edn- 2005 - M.H.Rashid–PHI - New Delhi.
2. "PowerElectronics : Converters, Applications" - 3nd Edition-2009 - N.Mohan - Tore.M.Undeland- W.P.Robbins –John Wiley &Sons – Singapore.

Reference Books:

1. Joseph Vithayathil, 'Power Electronics, Principles and Applications', McGraw HillSeries, 6th Reprint, 2013.
2. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.
3. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics:Converters, Applications and Design', John Wiley and sons, third edition, 2003.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	-	-	-	-	-	-	-	-
CO2	3	2	3	1	-	-	-	-	-	-	-	-
CO3	3	2	3	1	-	-	-	-	-	-	-	-
CO4	3	3	2	-		-	-	-	-	-	-	2
CO5	3	3	-	2	-	-	-	-	-	-	-	-
CO*	**3**	**6**	**2.75**	**1.25**								**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE424E **EHVAC TRANSMISSION SYSTEM**

Course Educational Objectives:
On successful completion of the course, students will be able to

1 Identify the different aspects of EHV A.C and DC Transmission Design and Analysis.
2 Know the importance of modern developments of EHV and UHV transmission systems.
3 Demonstrate EHV AC transmission system components, protection and insulation level for over voltages.
4 Understand the effect of corona on EHV transmission systems.
5 Understand design of EHV lines under transient condition, and cables.

Unit -I: **Introduction** **(9hours)**

E.H.V.A.C. Transmission line trends and preliminary aspect standard transmission voltages – Estimation at line and ground parameters-Bundle conductor systems-Inductance and Capacitance of E.H.V. lines – positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.

Unit -II: Electrostatic Field and Voltage Gradients **(9hours)**

Electrostatic field and voltage gradients – calculations of electrostatic field of AC lines – effect of high electrostatic field on biological organisms and human beings – surface voltage gradients and maximum gradients of actual transmission lines – voltage gradients on sub conductor.

Unit -III: **Electrostatic Induction in Unenergized Lines** **(9hours)**

Electrostatic induction in un-energized lines – measurement of field and voltage gradients for three phase single and double circuit lines – un energized lines. Power Frequency Voltage control and over voltages in EHV lines: No load voltage – charging currents at power frequency-voltage control – shunt and series compensation – static VAR compensation.

Unit -IV: **Corona in EHV Lines** **(9 hours)**

Corona in E.H.V. lines – Corona loss formulae- attention of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona – properties of radio noise – frequency spectrum of RI fields – Measurements of RI and RIV.

Unit -V: **Design of EHV Lines** **(9 hours)**

Design of EHV lines based on steady state and transient limits – EHV cables and their characteristics.

TOTAL: 45 Hours

Course Outcomes:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Understand the importance of EHV AC transmission	PO1,PO2
CO2	Estimate choice of voltage for transmission, line losses and power handling capability of EHV Transmission	PO1,PO2
CO3	Understand to measure the field and voltage gradient for EHV AC transmission lines.	PO1,PO2
CO4	Acquire knowledge on the effect of corona of EHV AC transmission systems	PO1,PO2
CO5	Understand the design of EHV AC lines under transient condition, and cables	PO1,PO2

Text Books:

1. R. D. Begamudre, "EHVAC Transmission Engineering", New Age International (p) Ltd. 3rd Edition.
2. K.R. Padiyar, "HVDC Power Transmission Systems" New Age International (p) Ltd. 2nd revised Edition, 2012.

References:

1. S. Rao "EHVAC and HVDC Transmission Engineering. Practice" Khanna publishers.
2. Arrillaga. J "High Voltage Direct Current Transmission" 2nd Edition (London) Peter Peregrines, IEE, 1998.
3. Padiyar. K.R, "FACTS Controllers in Power Transmission and Distribution" New Age International Publishers, 2007.
4. Hingorani H G and Gyugyi. L "Understanding FACTS-Concepts and Technology of Flexible AC Transmission Systems" New York, IEEE Press, 2000.

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-		-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**										

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
CHITTOOR – 517127 (Autonomous)
DEPARTMENT OF ELECTRICAL AND ELETRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE424F **SURGE PHENOMENON AND INSULATION CO- ORDINATION**

Course Educational Objectives:

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

1. Understand travelling wave phenomenon in transmission systems.
2. Study about successive reflections
3. Study about lightning phenomena and over voltage in power systems
4. Know different types of over voltages that originates in power systems.
5. Know Insulation gradation for different electrical power apparatus and Coordination in insulation systems.

Unit -I: Traveling Waves **(9 hours)**

Transmission line equation, attenuation and distortion point-Typical cases. Reflection of traveling waves: Behaviors of waves at a transaction point-Typical case. Travelling waves on multi conductor systems

Unit -II: Successive Reflections **(9hours)**

Reflection lattice, Effect of insulation capacitance. Standing waves and natural frequencies of transmission lines-Transient response of lines and systems with distributed parameters.

Unit -III: Lightning Phenomena and Over Voltage in Power Systems **(9hours)**

Mechanism of the lightning stroke – Mathematical model of the lightning stroke. Over voltages produced in power systems due to lightning – Over voltage due to faults in the system and switching surges. General principles of lightning protection – Tower – Footing resistance – Insulation withstand voltages and impulse flashover characteristics of protective gaps.

Unit -IV: Surge Voltage Distribution in Transformer Windings **(9hours)**

Initial and final distribution characteristics, Protection of windings against over voltages. Protection of transmission lines, transformers and rotating machines against over voltages. Use of rod gaps and lightning arresters protective characteristics. Selection of the lightning arresters.

Unit -V: Insulation Coordination **(9hours)**

Lightning surge and switching surge characteristics of insulation structures. Geo-metric gap factors test procedures, correlation between insulation for protective levels. Protective devices Zero arresters, vale type-etc, protective tubes.

TOTAL: 45 Hours

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Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand travelling wave phenomenon in transmission systems.	PO1,PO2,PO3
CO2	Analyze successive reflections	PO1,PO2, PO3
CO3	Understand various control strategies lightning phenomena and over voltage in power systems	PO1,PO2, PO3
CO4	Understand different types of over voltages that originate in power Systems.	PO1,PO2, PO3
CO5	Understand Insulation gradation for different electrical power apparatus and coordination in insulation systems.	PO1,PO2,PO3,PO12

Text Books:

1. Traveling waves of Transmission systems – by LV Bewley. Dover publications Inc., New York (1963).
2. Lewis, w.w., protection of transmission lines and systems against lightining, Dover publications, Inc., New York (1965).

Reference Books:

1. Diesendorf.W, Insulation Co-ordination ELBS in H.V. Electrical Power Systems, Butter worth publications, London, (1974).
2. Rakesh Das Begmudre,E.H.V. Transmission Engineering: Wielly Eastern Ltd.,New Delhi, (1986)

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	2	3	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	2
CO*	**3**	**2.6**	**2.8**									**2**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH IV-II SEM (EEE)

L	T	P	C
3	0	0	3

SUB CODE: 18EEE425 **PROJECT WORK**

1 Discovering potential research areas in the field of Electrical Engineering.
2 Comparing and contrast the several existing solutions for the problem identified.
3 Formulating and propose a plan for creating a solution for the research plan identified.
4 Conducting the experiments as a team and interpret the results.
5 Reporting and presenting the findings of the work conducted.

The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design / fabrication / analysis for a specific application, a research project with a focus on an application needed by the industry / society, a computer project, a management project or a design and analysis project. A project topic must be selected by the students in consultation with their guides.

To train the students in preparing project reports and to face reviews and viva voce examination. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

Course Outcomes:

On successful completion of course, the student will be able to		**POs related to COs**
CO1	Demonstrate in-depth knowledge on the project topic	**PO1**
CO2	Identify, analyze and formulate complex problem chosen for project work to attain substantiated conclusions.	**PO2**
CO3	Design solutions to the chosen project problem.	**PO3**
CO4	Undertake investigation of project problem to provide valid conclusions	**PO4**
CO5	Use the appropriate techniques, resources and modern engineering tools necessary for project work	**PO5**
CO6	Apply project results for sustainable development of the society.	**PO6**
CO7	Understand the impact of project results in the context of environmental sustainability.	**PO7**

CO8	Understand professional and ethical responsibilities while executing the project work.	**PO8**
CO9	Function effectively as individual and a member in the project team	**PO9**
CO10	Develop communication skills, both oral and written for preparing and presenting project report.	**PO10**
CO11	Demonstrate knowledge and understanding of cost and time analysis required for carrying out the project.	**PO11**
CO12	Engage in lifelong learning to improve knowledge and competence in the chosen area of the project.	**PO12**

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3		-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	-
CO7	-	-	-	-	-	-	3	-	-	-	-	-
CO8	-	-	-	-	-	-	-	3	-	-	-	-
CO9	-	-	-	-	-	-	-	-	3	-	-	-
CO10	-	-	-	-	-	-	-	-	-	3		-
CO11	-	-	-	-	-	-	-	-	-	-	3	-
CO12	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**