FORM NO.F/CDD/004 Rev.00 Date 20.03.2020



FACULTY OF ENGINEERING AND TECHNOLOGY

OUTCOME BASED EDUCATION

Curriculum and Syllabus

B.TECH (ELECTRICAL AND ELECTRONICS ENGINEERING)

(Part Time)

Regulation - 2022

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING



DEPARTMENT VISION STATEMENT

To produce competent electrical engineers who can excel in education/research/entrepreneurship skills and thereby building an energy efficient society.

DEPARTMENT MISSION STATEMENT

M1	To involve students in practical engineering skills through quality education
M2	To inculcate creative, innovative paths for multidisciplinary research and higher education
M3	To enhance entrepreneurial skills in electrical engineering for the societal challenges
M4	To render services continuously to meet the requirements of changing world in the Electrical Engineering Industry by educating students for global competition

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1	To involve in challenging real time electrical engineering problems such as design, manufacturing and testing of electrical machines
PEO2	To exploit the areas of entrepreneurship to become effective entrepreneurs and managers for electrical industries
PEO3	To engage in solving complex problems by applying relevant tools, techniques and electrical softwares

PEO with MISSION STATEMENT

	M1	M2	M3	M4
PEO1	3	1	2	2
PEO2	2	3	3	2
PEO3	2	1	2	3

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low



PROGRAMME OUTCOMES

PO1	Engineering Knowledge: Apply the Knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze 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 the public health and safety, and the cultural, societal, and environmental consideration.
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: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to access 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 multi-disciplinary settings
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
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 multi-disciplinary environments
PO12	Life –long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of Technological change



PEO-PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	2	3	3	2	2	2	2	2	2	3	2	1
PEO2	-	2	1	1	-	2	1	3	3	2	3	1
PEO3	2	3	2	2	3	2	2	3	3	2	1	2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low

PROGRAMME SPECIFIC OBJECTIVES

PSO1	To identify and investigate the problems in power system and provide solutions to the real time generation, transmission and distribution of power							
PSO2	To analyze and develop the modern power electronic devices using latest software tools							
PSO3	To design and manage the sustainable development in smart grid and electric vehicle technology.							

PEO with **PSO**

	PSO1	PSO2	PSO3
PEO1	3	2	2
PEO2	2	2	3
PEO3	2	3	2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low



Faculty of Engineering and Technology

Regulation 2022 – Framework

Total Credits: 100

Credit for I TO VII Semester: 100 Credits (Maximum)

Program Components

•	Basic Science (Mathematics) include according to program - 1							
•	Program Core theory	-	15					
•	Program Core Laboratory	-	5					
•	Program Elective	-	5					
•	Open Elective	-	-					
•	Open Lab	-	-					
•	Foreign Language	-	-					
•	Audit course	-	-					
•	Universal Human values	-	-					
•	Inter disciplinary theory	-	2					
•	Inter disciplinary Lab	-	-					
•	ETL	-	4					
•	Technical Skills	-	-					
•	Soft skill	-	-					
•	Project /mini project	-	2					



Curriculum - Electrical and Electronics Engineering (PT) 2022 Regulation

	I SEMESTER										
S.N O.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category			
1	EBMA22009	Laplace and Fourier Transforms	Ту	3	1/0	0/0	4	BS			
2	EBEE22002	DC Machines and Transformers	Ту	3	1/0	0/0	4	PC			
3	EBEE22004	Electromagnetic Field Theory	Ту	3	0/0	0/0	3	PC			
4	EBEE22ET2	Circuit Theory and Network Analysis	ETL	2	0/0	2/0	3	PC			
	PRACTICALS*										
1	EBEE22L11	Analog and Digital Electronics Lab	Lb	0	0/0	3/0	1	PC			

Credits Sub Total : 15

	II SEMESTER											
S.N O.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category				
1	EBEE22005	AC and Special Machines	Ту	3	0/0	0/0	3	PC				
2	EBEC22ID3	Communication Systems and IOT	Ту	3	0/0	0/0	3	ID				
3	EBME22ID1	Thermodynamics and Fluid Mechanics	Ту	3	0/0	0/0	3	ID				
4	EBEE22ET3	Linear and Digital Integrated Circuits	ETL	2	0/0	2/0	3	PC				
	PRACTICALS*											
1	EBEE22L12	Electrical Machines Lab	Lb	0	0/0	3/0	1	PC				

Credits Sub Total : 13

Note:

Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and lab/Internal evaluation

L/T/SLr/P/R/C: Lecture/Tutorials/Supervised Learning/Practical/Research/Credit

HS: Humanities and Social Science, ES:Engg. Science. BS: Basic Science, PC:Program core, PE:Program Elective, OE:Open Elective, P:Project

HS: Humanities and Social Science, ES:Engg. Science. BS: Basic Science, PC:Program core, PE:Program Elective, OE:Open Elective, P:Project



	III SEMESTER										
S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category			
1	EBEE22006	Generation, Transmission and Distribution	Ту	3	0/0	0/0	3	PC			
2	EBEE22008	Control System	Ту	3	0/0	0/0	4	PC			
3	EBEE22003	Measurements and Instrumentation	Ту	3	0/0	0/0	3	PC			
4	EBEE22ET4	Design of Electrical Machines	ETL	1	0/1	3/0	3	PC			
	PRACTICALS*										
1	EBEE22L13	Measurement and Control Lab	Lb	0	0/0	3/0	1	PC			

Credits Sub Total: 14

	IV SEMESTER										
S.NO.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category			
1	EBEE22007	Power System Protection and Switchgear	Ту	3	0/0	0/0	3	PC			
2	EBEE22009	Power Electronics	Ту	3	0/0	0/0	3	PC			
3	EBXX22EXX	Program Elective I	Ту	3	0/0	0/0	3	PE			
4	EBEE22ET5	Microprocessor Microcontroller and ARM Processor	ETL	3	0/0	0/0	3	PC			
	PRACTICALS*										
1	EBEE22L05	Power Electronics Lab	Lb	0	0/0	3/0	1	PC			

Credits Sub Total: 13

Note:

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L/T/SLr/P/R/C: Lecture/Tutorials/Supervised Learning/Practical/Research/Credit

HS: Humanities and Social Science, ES:Engg. Science. BS: Basic Science, PC:Program core, PE:Program **Elective, OE:Open Elective, P:Project**

HS: Humanities and Social Science, ES:Engg. Science. BS: Basic Science, PC:Program core, PE:Program **Elective, OE:Open Elective, P:Project**



	V SEMESTER										
S.N O.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category			
1	EBEE22010	Power System Analysis	Ту	3	1/0	0/0	4	PC			
2	EBEE22012	Electric Transients and High Voltage Engineering	Ту	3	0/0	0/0	3	PC			
3	EBEE22EXX	Program Elective II	Ту	3	0/0	0/0	3	PE			
4	EBEE22016	Energy Utilization and Conservation	Ту	3	0/0	0/0	3	PC			
	PRACTICALS*										
1	EBEE22L07	Power System Lab	Lb	0	0/0	3/0	1	PC			

Credits Sub Total :14

	VI SEMESTER									
S.N O.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category		
1	EBEE22013	Power Quality and Control of Power system	Ту	3	0/0	0/0	3	PC		
2	EBEE22EXX	Program Elective III	Ту	3	0/0	0/0	3	PE		
3	EBEE22EXX	Program Elective IV	Ту	3	0/0	0/0	3	PE		
4	EBEE22011	Solid State Drives	Ту	3	0/0	0/0	3	PC		
	PRACTICALS*									
1	EBEE22I05	Project Phase – 1	IE	0	0/0	3/3	2	Р		

Credits Sub Total :14

Note:

Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and lab/Internal evaluation

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HS: Humanities and Social Science, ES:Engg. Science. BS: Basic Science, PC:Program core, PE:Program **Elective, OE:Open Elective, P:Project**



VII SEMESTER									
S.N O.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category	
1	EBEE22014	FACTs and HVDC Transmission	Ту	3	0/0	0/0	3	PC	
2	EBEE22015	Smart Grid and Electric Vehicle Technology	Ту	3	0/0	0/0	3	PC	
3	EBEE22EXX	Program Elective V	Ту	3	0/0	0/0	3	PE	
PRACTICALS*									
1	EBEE22L10	Project Phase – II	Lb	0	0/0	16/1 6	8	Р	

Credits Sub Total :17

Note:

Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and lab/Internal evaluation

L/T/SLr/P/R/C: Lecture/Tutorials/Supervised Learning/Practical/Research/Credit

HS: Humanities and Social Science, ES:Engg. Science. BS: Basic Science, PC:Program core, PE:Program **Elective, OE:Open Elective, P:Project**

HS: Humanities and Social Science, ES:Engg. Science. BS: Basic Science, PC:Program core, PE:Program **Elective, OE:Open Elective, P:Project**

Credit Summary

Semester : 1 : 15

Semester : 2 :13

- Semester : 3 :14
- Semester : 4 :13
- Semester : 5 :14
- Semester : 6 :14
- Semester: 7 :17
- Total Credits : 100



	PROGRAM ELECTIVE –I										
S.NO.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category			
1	EBEE22E01	Wind Energy Conversion Techniques	Ту	3	0/0	0/0	3	PE			
2	EBEE22E02	IOT Applied to Electrical Engineering	Ту	3	0/0	0/0	3	PE			
3	EBEE22E03	Mechatronics	Ту	3	0/0	0/0	3	PE			
4	EBEE22E04	Fiber optics Communication	Ту	3	0/0	0/0	3	PE			

	PROGRAM ELECTIVE –II									
S.NO.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category		
1	EBEE22E05	Solar Energy Conversion Techniques	Ту	3	0/0	0/0	3	PE		
2	EBEE22E06	Green Building Technology	Ту	3	0/0	0/0	3	PE		
3	EBEE22E07	Neural Networks and its Application	Ту	3	0/0	0/0	3	PE		
4	EBEE22E08	Digital Signal Processing	Ту	3	0/0	0/0	3	PE		

PROGRAM ELECTIVE –III										
S.NO.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category		
1	EBEE22E09	Restructuring of Distribution System	Ту	3	0/0	0/0	3	PE		
2	EBEE22E10	DG and Energy Storage Technology	Ту	3	0/0	0/0	3	PE		
3	EBEE22E11	Material Science in Aviation	Ту	3	0/0	0/0	3	PE		
4	EBEE22E12	Power Plant Instrumentation	Ту	3	0/0	0/0	3	PE		

	PROGRAM ELECTIVE –IV									
S.NO.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category		
1	EBEE22E13	Safety for Electrical Engineers	Ту	3	0/0	0/0	3	PE		
2	EBEE22E14	Wide Area Monitoring Protection and Control	Ту	3	0/0	0/0	3	PE		
3	EBEE22E15	Robotics and Automation	Ту	3	0/0	0/0	3	PE		
4	EBEE22E16	Image Processing	Ту	3	0/0	0/0	3	PE		

PROGRAM ELECTIVE –V									
S.NO.	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ SLr	P/R	С	Category	
1	EBEE22E17	Substation Designing	Ту	3	0/0	0/0	3	PE	
2	EBEE22E18	Industrial Control and Instrumentation	Ту	3	0/0	0/0	3	PE	
3	EBEE22E19	Electric Traction	Ту	3	0/0	0/0	3	PE	
4	EBEE22E20	Environmental Science and Engineering	Ту	3	0/0	0/0	3	PE	



Table. 1: Components of Curriculum and Credit distribution for E&T Programmes

Course	Description				Credit	Contact
Component		No. of			Weightage	hours
		Courses	Credits	Total	(%)	
Basic Science`	Theory	1	4			60
	Lab	0	0	4	4	0
	ETL	0	0			0
Engineering Science	Theory	0	0	0	0	0
	Lab					
	ETL					
Humanities and	Theory	0	0	0	0	0
Social Science	Lab					
	ETL					
Program Core	Theory	15	48			720
	Lab	5	5	65	65	15
	ETL	4	12			240
Program Electives	Theory	5	15	15	15	225
Open Elective	Theory	0	0	0	0	0
	Lab					
Inter-disciplinary	Theory	2	6			90
	Lab	0	0	6	6	0
	ETL	0	0			0
Skill Component		0	0	0	0	0
Internship/Project		2	10	10	10	450
Others if any		0	0	0	0	0
NPTEL/SWAYAM						
Online Courses						
	TOTAL	35	100	100	100%	1800

Note:

Basic Science: Mathematics, Physics and Chemistry.

<u>Engineering Science</u>: Engineering Graphics, Basics of Mechanical and Civil Engineering, Basics of Electrical and Electronics Engineering, C Programming and MS office tools, Python Programming <u>Humanities and Social sciences</u>:

English, Foreign language, Environmental Studies, Management, Entrepreneurship, Indian Constitution and Indian Traditional Knowledge, Universal Human Values.

Skill Component:

Technical Skill, Soft Skill, internship.

Note:

Following categories should be available in the mapping page of each subject



Table 2: Revision/modification done in syllabus content:

S.No	Course (Subject) Code	Course (Subject) Name	Concept/ topic if any, removed in	Concept/topic added in the new curriculum	% of Revision/ Modification done
			current curriculum		
1.	EBEE22001	Basic Electrical, Electronic and Instrumentation Engineering	Basics of power system	Sensors and Transducers	20%
2.	EBEE22ET2	Circuit Theory and Network Analysis	S-domain Analysis and network synthesis (poles and zeros transforms already learnt in BEE22001)	 Resonance and three phase circuits Lab component included 1.Determination of self, mutual inductance and coefficient of coupling 2.Design and Simulation of low pass and high pass passive filters 3.Design and Simulation of series resonance circuit. 4.Design and Simulation of parallel resonant circuits 5.Simulation of three phase balanced and unbalanced star, delta networks 	50%
3	FBFF22003	Measurements and	Transducers and converters	Current power and energy measurements	20%
5.	LDEE22005	Instrumentation	Transducers and conventers	current, power and energy measurements	2070



3.	EBEC22IL3	Communication Systems	Signal processing experiments	IOT experiments were added	50%
		and IOT Lab	were removed		
4.	EBEE22006	Generation,	Faults & Protection	Mechanical design of lines and Insulators	30%
		Transmission and		(Unit II)	
		Distribution		Underground cables: Construction,	
				Classification, Capacitance of 2 core and 3	
				core cables	
5.	EBEE22L02	Measurement and	1.Ramp response Characteristic	Study of CRO	20%
		Instrumentation Lab	of filled in system thermometer.		
			2.P/I and I/P converter		
			3. Hall effect transducers		
6.	EBEE22007	Power System protection	Modeling of power system	Protection schemes	20%
		and switchgear	components		
7.	EBEE22008	Control System		Conversion of state variable models to	20%
				transfer function and vice versa	
8.	EBEE22009	Power Electronics	AC and DC drives	1. DC to DC converters	40%
				2. AC to AC converters	
9.	EBEE22L05	Power Electronics Lab	Dives experiments		20%



Table3:

<u>List of New courses/ value added courses//life skills/Electives/interdisciplinary /courses</u> <u>focusing on employability/entrepreneurship/skill development.</u>

S. No	New courses (Subjects)	Value added courses	Life skill	Electives	Inter Disciplinary	Focus on employability/entrepreneur ship/ skill development
1.	EBMA22009/Laplace and Fourier Transforms				Yes	
2.	EBCS22ID2/ Artificial Intelligence and Expert systems				Yes	Employability
3.	EBEE22011/Solid State Drives					Employability
4.	EBEE22010/Power System analysis					Employability
5.	EBEE22012/Electric Transients and high voltage Engineering					Employability
6.	EBEE22014/FACTs and HVDC Transmission					Employability
7.	EBEE22015/Smart grid and Electric Vehicle Technology					Skill development/ Employability
8.	EBEE22E04/Fiber Optics Communication			Yes	Yes	
9.	EBEE22E15/Robotics and Automation					Employability
10.	EBEE22E20/Environmen tal Science and Engineering			Yes	Yes	



Course Code: EBMA22009	Course N TRANSI	Name: L FORMS	LAPLA	CE ANI) FOUF		, T	Fy/Lb/ ETL/IE	L	T/S	Lr P	P/R	С	
	Preregui	site: Fi	rst veau	·Fnging	ering N		atics			3	1/0		/0	4
L · Lecture T · T	Tutorial S	$SIC I r \cdot Su$	nervise(l Learni	$n\sigma \mathbf{P} \cdot \mathbf{F}$	Project I	2 · Rese	arch C· (Tredits	J	1/0		U	-
Tv/Lb/ETL : Th	eorv/Lab/H	Embedde	ed Theor	rv and I	ab	Tojeet I			oreans					
OBJECTIVES	:													
The student sh	ould be m	ade to:												
• To be al	ole to unde	rstand c	oncepts	in Lapla	ace Tran	sforms								
• To be al	ole to apply	y Laplac	e Trans	forms										
• To be al	ole to unde	rstand c	oncepts	in Fouri	ier serie	s								
To unde	erstand the	concept	s in Fou	rier and	Z Trans	sforms								
COURSE OUT	COMES ((COs) :												
CO1	To be abl	le to und	lerstand	the cond	cepts in	Laplace	Transfo	orms						
CO2	To be abl	e to app	ly Lapla	ace Tran	sforms									
CO3	To be abl	e to find	1 fourier	series s	olutions									
CO4	To be abl	le to app	ly Fouri	er trans	forms									
CO5	To be abl	le to app												
Mapping of Cou	rse Outcor	Outcomes with Program Outcomes (POs)												
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	D10	PO11	PO	D12
CO1	3	2	2	3	3	1	1	2	2		1	1		2
CO2	2	2	1	3	1	2	1	2	3		1	1		2
CO3	3	2	1	3	2	3	2	1	1		2	1		3
CO4	3	2	1	2	1	3	2	1	1		1	1		2
CO5	3	3	1	2	1	2	2	1	1		2	2		3
COs / PSOs]	PSO1			PSO2			PSO	3					
CO1		3			3			3						
CO2		3			3			3						
CO3		3			3			3						
CO4		3			3			3						
CO5		3			3			3						
3/2/1 Indicates S	strength of	Correla	<u>t10n, 3 –</u>	- H1gh, ′∠	2- Medii	ım, 1- L	ow						<u> </u>	
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Internships / Technical Skill	Soft Skills								
	\checkmark													

(An ISO 21001 : 2018 Certified Institution) Perivar E.V.R. High Road, Maduravoval, Chennai-95, Tamili

Course Name: LAPLACE AND FOURIER Course Code: T/SLr P/R Ty/Lb/ L С EBMA22009 **TRANSFORMS** ETL/IE **Prerequisite: First year Engineering Mathematics** 3 4 Ty 1/00/0

UNIT I LAPLACE TRANSFORMS

Transforms of simple functions - Properties of Transforms - Inverse Transforms - Transforms of Derivatives and Integrals.

UNIT II **APPLICATIONS OF LAPLACE TRANSFORMS**

Periodic functions – Initial and final value theorems – Convolution theorem – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients and Linear simultaneous differential equations of first order with constant coefficients.

FOURIER SERIES UNIT III

Dirichlet's conditions – General Fourier series – Half range Sine & Cosine series – Complex form of Fourier series – Parseval's identity -Harmonic Analysis.

UNIT IV FOURIER TRANSFORMS

Statement of Fourier integral theorem – Fourier transform pairs – Fourier Sine and Cosine transforms – Properties – Transforms of simple functions - Convolution theorem - Parseval's theorem.

UNIT V Z TRANSFORMS AND DIFFERENCE EQUATION

Z-transforms – Elementary properties – Inverse Z transforms – Partial fraction – Residue method – Convolution theorem – Solution of difference equation using Z transform (simple problems).

Total no. of Periods: 60

REFERENCE BOOKS

- 1) Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2008).
- 2) Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw Hill Publishing Co., (2005).
- 3) Singaravelu, Transforms and Partial Differential Equations, Meenakshi Agency, (2017).
- 4) Kreyszig E., Advanced Engineering Mathematics (9th ed.), John Wiley & Sons, (2011).
- 5) Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).



nadu, India

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Course Code: EBEE22002	Course TRAN	e Name SFORN	: DC N MERS	IACHI	NES AN			Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C		
	Prereq	uisite:	Basic I	Electric	al, Elect	ronics a	nd		Ту	3	1/0	0/0	4	
	Instru	mentati	ion Eng	ineerin	g .									
L: Lecture T : Tu	itorial SL	r : Supe	rvised I	_earning	g P: Proje	$\operatorname{ect} \mathbf{R} : \mathbf{R}$	lesearc	h C :						
Credits I/L/EIL:	I neory/La	id/Emb	eaded I	neory a	nd Lab									
UDJECTIVES	1		a 4 h a	.	manuta a	6 410 0 10 4	atin a ai							
To provid To formili	anize and	wieuge	on the	Dasic co	a muinain	l the rot	and C	ircuits.	tronoform		nd that			
• 10 famili	arize and	undersi		WORKIN	g princip	le of the	e DC m	lachines,	transform	iers a	ind thei	r		
	lice chara	dge on	s transfoi	mer coi	nactions									
 To provid To provid 	le knowle	dge on	etarting	and me	thods of	speed c	ontrol	of motors						
To provid To study	the variou	uge on	starting s and di	fferent f	esting m	ethods t	for DC	machine	s and Trai	nsfor	mers			
COURSE OUT(COMES ($\overline{\mathbf{Cos}}$	s and u		testing in	cuious		machine		13101	mers			
Students complet	ing this co	ourse w	ere able	to										
C01	Evoke	the prin	ciples b	ehind E	lectrical	machin	es							
CO2	Compr	ehend tl	he work	ing of C	Generator	s, Trans	sformer	rs and Mo	otors					
CO3	Articul	ate the d	characte	ristics	of Gener	tors Tr	ansfor	mers and	Motors					
CO4	Analyz	e and d	esign of	f the Ele	etrical m	achines	ansion		WIOLOIS					
<u> </u>	Cometin	utinize and test the dc machines & transformers												
005	Scrutin	ize and	test the	de mae	nines &	ransfor	mers							
Mapping of Cou	rse Outco	Outcome with Program Outcome (POs)												
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Course Code: EBEE22002	Course Name: DC MACHINES AND TRANSFORMERS	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
	Prerequisite: Basic Electrical, Electronics and	Ту	3	1/0	0/0	4
	Instrumentation Engineering					

UNIT I ELECTROMECHANICAL ENERGY CONVERSION

Principles of electromechanical energy conversion – Energy, Co-energy – Elementary concepts of rotating machines – - Rotating magnetic field - generated voltage-Torque - Magnetic Leakage

UNIT II **DC GENERATORS**

Constructional features of DC machine – Principle of operation of DC generator – EMF equation – Methods of excitation and types of DC generators - Characteristics of Series, Shunt and Compound DC generators -Armature reaction - Commutation - Methods of improving commutation - Parallel operation of DC shunt and compound generators

UNIT III **DC MOTORS**

Principle of operation of DC motors-Back EMF and its significance-Torque equation-Types of DC motors- Voltage Equation – Characteristics of DC series, shunt and compound motors– Starting of DC motors–Types of starters–Speed control of DC series and shunt motors-Power flow, losses and efficiency

UNIT IV TRANSFORMERS

Principle of operation – Constructional features of single phase and three phase shell type and core type transformers– EMF equation-Transformer on No load and Load-Phasor diagram-Parameters referred to HV/ LV windings -Equivalent circuit - three phase transformers-connections - Scott Connection-Regulation --Autotransformers

UNIT V **TESTING OF DC MACHINES & TRANSFORMERS**

Losses and efficiency in DC Machines and transformers - Condition for maximum efficiency - Testing of DC machines - Brake test, Swinburne's test, Retardation test and Hopkinson's test - Testing of transformers - Polarity test, load test, open circuit and short circuit tests, Sumpner's test-All day efficiency.

TEXT BOOKS

- 1. Kothari, D.P, Nagrath, I.JN (2010) Electrical Machines. Tata McGraw Hill Publishers.
- 2. Murugesh Kumar, K. (2003) DC Machines & Transformers. Vikas Publishing House Pvt Ltd.
- Theraja, B.L. Chand, S. (2011) Electrical Technology Volume. II AC/DC Machines. 3.

REFERENCE BOOKS

- 1. Fitzgerald, A. E. Charles Kingsley Jr, Stephen, D. Umans (2020) Electric Machinery. 7th Ed, McGraw Hill Companies.
- 2. Hill Stephen, J. Chapman, (2012) Electric Machinery Fundamentals, 5th Ed, McGraw Hill Companies, New Delhi
- 3. Bimbhra, P.S. (2003) Electrical Machinery. Khanna Publishers.
- 4. Gupta, JB. (2015) Theory & Performance of Electrical Machine, S.K. Kataria & Sons

12

Total No. of Periods :60

12

12

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12



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Course Code: EBEE22004	Course N	Name:	ELEC	TROM	AGNETI	C FIEI	LD THI	EORY	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С	
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L · Lecture T · Tute	orial SLr ·	Superv	ised Le	arning F	• Project	R · Res	earch C	•					L	
CreditsT/L/ETL:Th	heory/Lab/	Embed	ded The	eorv and	Lab	10.1005	euren e	•						
OBJECTIVES	licor j / Liuo/	2111000		cory und	Luc									
OBJECTIVE:														
• To acquire k	cnowledge	in Elec	tromag	netic fie	ld theory									
To provide a	a solid fou	ndation	in Elec	trostatic	es such as	Dipole	Canac	itance						
 To provide a To attain fai 	miliarity in	Bound	arv cor	ditions	and Mag	poie	, cupue Id	itunee						
 To understation 	nd the rela	tion bet	tween f	ield theo	ry and ci	reuit the	Porv							
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Students completin	of this cour	se were	e able to	C										
CO1	Recall the	basics	of elect	romagn	etic field	theory								
	Realize the	e conce	nte like	Flectro	statics su	ch as Di	inole C	anacita	nce and el	ectri	noten	tial etc		
C03	Invostigat	the R	pundara	conditi	one in El	otrio or	d Magr	apacital		cent	poten			
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L T/SLr P/R **Course Code: Course Name: ELECTROMAGNETIC FIELD THEORY** Tv/Lb/ **EBEE22004 ETL/IE**

Electrical,

UNIT I ELECTROSTATIC FIELD

Prerequisite:

Introduction- Concepts of different co-ordinate systems -Electric field intensity- Electric flux density-electric fields due to charge distributions- Electric potential - potential gradient -Gauss law & Coulomb's law with Application

UNIT II **ELECTROSTATICS**

Field due to dipoles - Dipole moment - Current and Current density, Boundary conditions at dielectric and conductor surfaces - Capacitor - Capacitance - Energy stored and energy density - Capacitance due to Spherical shell, Coaxial cable

MAGNETOSTATICS **UNIT III**

Introduction to Magnetic materials- Magnetic field intensity- Magnetic flux density (B) – B in free space, conductor, magnetic materials. Magnetization and Permeability – Boundary conditions- Lorentz Law of force– Biot-Savart Law - Ampere's Law - Magnetic field - Scalar and vector potential - Magnetic force - Torque - Inductance

UNIT IV ELECTRODYNAMICFIELDS

Faraday's law, induced EMF – transformer and motional EMF, Maxwell's equations (differential and integral forms) – Displacement current - Relation between field theory and circuit Theory.

UNIT V **ELECTROMAGNETIC FIELDS AND WAVE PROPAGATION**

Basic

Instrumentation Engineering

Generation – electromagnetic wave equations – Wave parameters- velocity, intrinsic impedance, propagation constant - Wave propagation in free space, loss and lossless dielectrics, conductors - skin depth, Poynting vector

Total No. of Periods: 45

20

TEXT BOOKS

- 1. William Hayt, (2005) Engineering Electromagnetics.7th Edn, McGraw Hill.
- 2. Matthew. N.O. Sadiku, (2007) Elements of Electromagnetics.4th Edn, First Indian Edition, Oxford University Press.
- 3. Ashutosh Pramanik, (2006) Electromagnetism theory and application, Prentice Hall of India Private Ltd.

REFERENCE BOOKS

- 1. David K. Cheng, (2004) Field and Wave Electromagnetics, 2nd Edn, Pearson Education.
- 2. William H. Hayt Jr, John A. Buck, (2006) Engineering Electromagnetics, 7th Edn, Tata McGraw Hill Publishing Company Ltd.
- 3. Edminister, J.A. Schaum's, (2006) Theory and problems of Electromagnetics, 2nd Edn, Special Indian Edition, Tata McGraw hill.

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Electronics

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Course Coo EBEE22ET	le: Cours 2 NETV	se Name VORK A	: CIRO ANALY	CUIT T ZSIS	HEORY	AND	Ty. ET	/ Lb/ L/IE	L	T/S Lr	P/ R	С		
	Prere	quisite:	Basic I	Electric	al, Elect	ronics a	nd	E	TL	2	0/0	2/0	3	
.		imentati	on Eng	ineerin	lg · D	D .	D D		a 11.					
L: Lecture $T/I/ETI \rightarrow T$	I: Tutorial	SLr : S Embadd	Supervis	sed Lea	rning P	: Project	$\mathbf{R}:\mathbf{R}$	esearch C: 0	Credits					
ORIECTIN	Theory/Lab/	Embedde	ed Theo	ory and	Lau									
•	To underst	and the b	asics of	Electri	c Circuit	S								
•	To impart l	cnowledg	ge on ne	twork t	theorems									
•	To impart l	cnowledg	ge on th	e conce	pts of tra	insient re	esponse	e of circuits						
•	To underst	and Netw	ork gra	phs, cu	t sets and	l Duality	of the	network						
•	To underst	and and s	solving	the two	port net	works, v	arious	types of filt	ers and	Atten	nuators	5		
COURSE O	DUTCOMI	ES (Cos)	: (3-5)	<u> </u>										
C01	Apply	the know	wledge	of circu	iital laws	and red	uce any	y given elec	trical ne	twor	k			
CO2	Abilit	y to solve	e simple	est to co	omplex c	ircuits by	y apply	ing circuita	l laws a	nd th	eorem			
CO3	Know	ledge ab	out Cou	pled ci	rcuits and	1 Transie	ent Res	ponse of Ci	rcuits					
CO4	Famil	iarizatior	n of Net	work g	raphs and	l solve t	wo por	t networks						
CO5	Abilit	y to build	l electri	c circui	ts and an	alyze vo	oltage, o	current & p	ower flo	w th	rough	the cir	cuit	
Mapping of	Course O	e Outcomes with Program Outcomes (POs)												
COs/POs	PO1	O1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 3 3 3 2 2 1 1 2 3 2 3 2												
CO1	3	3	3	2	2	1	1	2	3	2	2	3	2	
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CO3	2	1	2	1	1	2	2	1	3	2	2	3	1	
CO4	1	2	1	2	2	2	3	1	2	3	3	3	1	
CO5	3	3	3	3	2	3	2	1	2	2	2	3	1	
COs / PSC	s	PS	01			PS	502				PSC)3		
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TEXT BOOKS

- 1. Sudhakar, A. Shyammohan, S. and Palli (2015) Circuits and Networks: Analysis and Synthesis, 5th Edn, Tata McGraw-Hill
- 2. A. Chakrabarthy (2010), Circuit Theory. 5th Ed. Dhanpat Rai & Sons Publications, New Delhi.
- 3. Smith, K.A. and. Alley, R.E (2014) Electrical Circuits, Cambridge University Press

Network parameters- Analysis of T, Ladder, Bridged T and Lattice Networks - Filters

Prerequisite: Prerequisite: Basic Electrical, Electronics

UNIT V **RESONANCE AND THREE PHASE CIRCUITS**

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Analysis of three phase 3wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced-power measurement in three phase circuits

UNIT I BASIC CIRCUIT CONCEPTS

ANALYSIS

Course Code:

EBEE22ET2

Basic circuit elements-Ideal sources-Ohm's law-Kirchoff's voltage laws-Network reduction: Voltage and Current division, Source Transformation-Series and Parallel combination of R, L and C – Mesh and Nodal analysis for D.C and A.C circuits

UNIT II NETWORK THEOREMS AND COUPLED CIRCUITS

and Instrumentation Engineering

9 Network theorems (Analysis of DC and AC Circuits): Thevenin, Norton, Superposition, Maximum power transfer and Reciprocity.

UNIT III NETWORK TOPOLOGY AND TRANSIENT ANALYSIS

9 Graph theory -Branch Nodal Analysis-Link loop Analysis-Tie set and Cut set matrices- Duality. Transients: Behavior of circuit elements under switching conditions and their representation- Forced and free Response of RL, RC, RLC circuits with DC and AC excitations.

UNIT IV **TWO PORT NETWORKS, FILTERS AND ATTENUATORS**

Characterization of two port networks in terms of Z, Y, H and T parameters-network equivalents -Relation between

9

LAB COMPONENT:

- 1. Experimental verification of Kirchhoff's voltage and current laws and Current and Voltage Division and Source Transformation
- 2. Verification of Nodal and Mesh Analysis.
- 3. Experimental verification of theorem.
- 4. Experimental determination of time constant of series R-C electric circuits
- 5. Experimental determination of frequency response of RLC circuits.
- 6. Determination of two port network parameters.
- 7. Experimental determination of power in three phase circuits by two-wattmeter method
- 8. Simulation of three phase balanced and unbalanced star, delta networks circuits

Total No. of Periods: 60

22





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OBJECT	VE:													
•	To ki	now th	e basic l	nowledg	e of log	gic gates								
•	Desig	gn kno	wledge	on imple	nentati	on of Bo	olean I	Functio	n					
•	Stude	ents ab	le to des	ign Coui	nters, R	egisters	using f	lip-flop	os					
•	Stude	ents ac	quire kn	owledge	in prog	ramming	g of vei	ry log l	HDL					
	To st	udy at	out mul	iplexers	and de	multiple	xers							
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		Unde	erstand t	ie basic o	concept	s of logi	$\frac{c \text{ gates}}{1}$		CD 1		•			
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C04		Unde	rstand the concepts in programming of very log HDL ble to understand about multiplexers and de multiplexers											
C05		Capa	able to understand about multiplexers and de multiplexers											
Mapping	of Cou	rse O	Outcomes with Program Outcomes (POs)											
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	POI	10 PO1	1	PO12
CO1		3	3	3	3	2	2	2	3	3	2	1		2
CO2		2	2	2	2	3	3	2	2	2	1	2	r	3
CO3		3	3	3	2	2	2	3	3	2	3	2		1
CO4		3	3	2	2	1	1	2	3	2	2	3		2
CO5		2	2	2	2	1	2	2	3	2	1	2		2
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H/M/L 1nd	icates l	Streng	ength of Correlation H- High, M- Medium, L-Low											
Category	Basic	Sciences	Engineeri ng Science	Program Elective Program Elective Program Elective Program								Internship s/Technic	al skills	Soft skills
0						✓								



Course Code:	Course Name: ANALOG AND DIGITAL	Ty/ Lb/	L	T/SLr	P/R	С
EBEE22L11	ELECTRONICS LAB	ETL/IE				
	Prerequisite: Diploma basic Electronics	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS

- 1. Study of Logic Gates & Digital Logic families
- 2. Implementation of Boolean functions
- 3. Adders & Subtractors
- 4. Multiplexers and de-multiplexers
- 5. Study of Flip-flops
- 6. Study of Registers
- 7. Study of Counters
- 8. Design and Testing of RC Phase shift, LC Oscillators
- 9. Single phase half wave and full wave rectifiers with inductive and capacitive filters
- 10. A stable and Mono stable Multi vibrators

Total No. of Periods: 45



Course Code:	Course 1	Name: A	AC AN	D SPEC	CIAL M	ACHIN	ES		Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C	
EBEE22005	Prerequ	isite: D	C Mac	hines a	nd Trans	sforme	S		Ту	3	0/0	0/0	3	
L : Lecture T :	Tutorial S	SLr : Suj	pervised	1 Learni	ng P: Pro	oject R :	Resear	ch C :						
CreditsT/L/ET	L:Theory/	Lab/Em	bedded	Theory	and Lab)								
OBJECTIVE	S													
Underst	ands the c	onstruct	ion and	l operati	on of Sy	nchrono	us gen	erator						
Acquire	es Knowle	dge abo	ut syncl	nronous	motors u	used in t	he Pow	er syster	n					
Able to	learn abou	it three	phase ii	nduction	n motor a	nd to dr	aw the	circle dia	agram of	Indu	ction m	achine	e	
Gains k	nowledge	in starti	ng and	speed co	ontrol of	three ph	ase inc	luction m	otor					
• Underst	and the co	oncepts o	of vario	us speci	al machi	nes invo	olved ir	the pow	er system	n net	work			
COURSE OU	TCOMES	S (Cos)												
Students comp	leting this	course	were ab	le to										
CO1	Recognize	the AC a	and Spec	cial mach	ines									
CO2	Demonstra	te the wo	orking p	rinciple o	of Synchro	onous Ge	enerator	Induction	n Motors a	and v	arious S	pecial		
	Machines													
CO3	Apply the	concept l	earn abo	out the m	achines ir	n real tim	e to exh	ibit a cos	t-effective	solu	tion			
CO4	Analyze th	yze the complex issues in using the synchronous generators, induction motors and special machines												
	and provid	lyze the complex issues in using the synchronous generators, induction motors and special machines provide a suitable solution to meet the requirement												
CO5	Simplify th	e structu	re and d	lesign of	Synchron	ious gene	erators,	nduction	motors an	d Spe	ecial ma	chines		
Mapping of C	ourse Ou	tcome v	vith Pro	ogram (Outcome	e (POs)								
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<u>CO3</u>	2	2	2	3	2	2	3	2	3	2	2		3	
<u>CO4</u>	3	3	3	2	3	3	2	3	2	3	3		2	
<u>CO5</u>	2	2	2	3	2	2	3	2	3	2	2		3	
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Course Name: AC AND SPECIAL MACHINES Ty/Lb/ L T/SLr ETL/IE

UNIT I SYNCHRONOUS GENERATOR

Types & Constructional Features of Synchronous Generators- EMF Equation - Synchronous reactance - Armature reaction - Voltage regulation - EMF, MMF and ZPF methods - Change of excitation and mechanical input - Application

UNIT II SYNCHRONOUS MOTOR

Principle of operation – Construction – Equivalent Circuit and phasor diagram – Power and Torque – Power flow – Power developed by synchronous motors – Speed-Torque characteristics – Effect of change in excitation – V curves and inverted V curves – Hunting & suppression - Application

UNIT III THREE PHASE INDUCTION MOTOR

Construction – Types of rotors – Cage and wound rotor machines – Principle of operation – Production of rotating magnetic field – Equivalent circuit – Torque and Power output – Torque-slip characteristics – Condition for maximum efficiency – Testing – Load Test – No load and Blocked rotor test – Circle diagram.

UNIT IV STARTING & SPEED CONTROL OF INDUCTION MOTORS

Prerequisite: DC Machines and Transformers

Necessity for Starters – Starting methods of three phase induction motor – Types of Starters – Stator resistance and reactance – Rotor resistance starter- star-delta starter – Cogging & Crawling – Speed control – Voltage control –Rotor resistance control.

UNIT V SPECIAL MACHINES

Single phase induction motor – Constructional details – Double revolving field theory – Equivalent circuit –Speed-torque characteristics – Starting methods – Split-phase motor - shaded-pole induction motor – Universal motor – Variable Reluctance motor, Switched Reluctance Motor, Stepper Motor, Permanent Magnet Motors - Application

TEXT BOOKS

Course

EBEE22005

Code:

- 1. Nagrath, I.J. Kothari, D.P. (2005) Electric Machines.7th Ed. New Delhi: T.M.H publishing Co Ltd.
- 2. Bhimbhra, P.S. (2007) Generalised Theory of Electrical Machines, Khanna Publishers.
- 3. E.G. Janardanan (2014) Special electrical machines, PHI learning Private Limited, Delhi.
- 4. Bhimbhra, P.S. (2003) Electrical Machinery. Khanna Publishers.

REFERENCE BOOKS

- 1. Fitzgerald, Kingsley, Umans, (1990) Electric Machinery. 5th Ed. New Delhi: McGraw Hill Books co.
- 2. Stephen J. Chapman, (1985) Electric Machinery Fundamentals. New Delhi: McGraw Hill Book Co.
- 3. Say, M.G. (1980) Alternating current Machines.4th Ed. ELBS & Pitman. London:
- 4. Sen, S.K. (1984) Electrical Machinery. New Delhi: Khanna Publishers.
- 5. Mukherjee, P.K. and Chakravorty, S (2004) Electrical Machines, Dhanpat Rai& Sons.



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Total No. of Periods: 45



C E	Course Code BEC22ID3	: Cour IOT	Course Name: COMMUNICATION SYSTEMS AND IOTTy/ Lb/ ETL/IELT/SLrP/RCCCCCCCCC												
		Prer	equisite	: Basic	Electri	cal, Elec	tronics	and			Ту	3	0/0	0/0	3
		Instr	umenta	tion En	gineeri	ng									
L	: Lecture T	: Tutorial	SLr : Su	upervise	d Learn	ing P: Pr	oject R	: Res	searc	ch C :					
0	redits T/L/ET	L:Theor	y/Lab/Ei	mbeddeo	1 Theor	y and Lat)								
C	BJECTIVE	<u></u>	1 0	D ! ! 1	a										
•	To understa	and the A	nalog &	Digital	Comm	unication					1. (1				
•	To study at	bout the n	nethods	to conve	ert Anal	og to Dig	ital cor	nmur	ncat	10n usii	ng code tr	leor	у.		
•	To study at		madia	Julation	lecnniq	lues	-								
•	To introduc		t of Into	ior uigit mot of T	al comm	numeatio	ll world	aaana	neio						
•	'OUBSE OI	TCOM	$\frac{1}{5} \frac{1}{5} \frac{1}$		mings i	n the real	-world	scena	1110						
S	tudents com	oleting th	is course	e were a	ble to										
		Unde	erstand t	he conce	ent of A	nalog and	1 Divita	l Coi	mmi	micatio	n				
	$\frac{co1}{CO2}$	Relat	e variou		unicatio	on technic	mes m	odula	ation	schem	e and IO	Г			
	<u>CO3</u>	Illust	rate the	applicat	ion of I	OT mod	ulation	and i	nfor	mation	theory	.			
	<u>CO4</u>	Parat	hrase th	e conce	pt of co	o r, mou	tion sv	stem	and	IOT	uncory				
	<u>CO5</u>	Conr	ect vari		munica	tion devi	res with	moo	dern	tool fo	r hetter si	istai	nability		
N	Iapping of (Course O	e Outcome with Program Outcome (POs)												
	COs/POs	PO1	O1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12												
	CO1	3	2	1	1	2	3	1		2	1	3	3		3
	CO2	3	2	2	2	3	3	1		2	3	2	2		2
	CO3	2	3	3	2	3	2	1		2	3	1	2		2
	CO4	3	2	3	2	3	3	3	,	2	2	3	2		1
	CO5	3	3	2	1	3	3	3	,	3	1	2	3		2
	COs /PSOs	5	PS	501			PS	02			·]	PSO3		
	CO1			3				2					3		
	CO2			2				3					2		
	CO3			3				2					3		
	CO4			2				1					2		
	<u>CO5</u>		1 1 9 9	3				2					2		
	3/2/1 Indica	ates Stren	es Strength of Correlation, 3–High, 2-Medium, 1-Low												
	tegory	Basic Sciences	Basic Sciences Engineering Sciences Humanities and Socia Sciences Program Core Program Electives Open Electives Interdisciplinary Skill Component Practical / Project												
	Ca										\checkmark				

Course Code: EBEC22ID3	Course Name: COMMUNICATION SYSTEMS AND IOT	Ty/Lb/ ETL/IE	L	1/SLr	P/K	C
	Prerequisite: Basic Electrical, Electronics and Instrumentation Engineering	Ту	3	0/0	0/0	3

UNIT I **SIGNALS & NOISE**

Periodic & Aperiodic Signals – Noise - External Noise – Thermal Agitation – Shot Noise – Noise Figure – Signal to Noise ratio - Equivalent Noise resistance.

UNIT II INTRODUCTION TO COMMUNICATION

Basic Communication systems – Need for Modulation in communication systems – Amplitude Modulation – Double Side Band Amplitude Modulation - Single sideband and VSB modulation - modulators. AM Transmitter and Receiver, FM transmitter and Receiver.

UNIT III MODULATION TECHNIQUES AND PULSE MODULATION

Phase modulation – Noise triangle – Pre-emphasis and de-emphasis – Stereophonic FM multiplex system – comparison of wideband and narrow band FM - AFC - Sampling theorem -Quantization, Quantization Error, PAM, PWM, PPM, PCM.

UNIT IV DIGITAL MODULATION & INFORMATION THEORY

ASK, FSK, PSK, Transmitter and Receiver. Introduction-Information & Entropy, Source Coding Theory, Discrete Memory less Channel, Mutual Information Channel Capacity, Channel Coding Theory.

UNIT V **INTERNET OF THINGS**

Introduction - Block diagram of IoT- IoT Architecture - Communication Technologies in IoT - Cloud Storage in IoT-Data Storage in IoT – Applications of IoT – Smart Home, Smart City, Smart Agriculture, Health Monitoring System.

Total No. of Periods: 45

TEXT BOOKS

- Roy Blake, (2002) Electronic Communication systems. 2nd Edn, Thomson Learning. 1.
- George Kennedy, (1992) Electronic communication systems, Tata McGraw Hill publications. 2.
- Michael Miller, (2015) The Internet of Things, Que Publishing 3.

REFERENCE BOOKS

- 1. Bruce Carlson, A. Taub & Schilling, (1986) Principles of Communication Systems, Tata McGraw Hill.
- 2. Simon Haykins, (2001) Principles of Communications, Prentice Hall of India.
- 3. Arshdeep Bahga, Vijay Madisetti (2015) Internet of Things A hands-on approach, Universities Press





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Course Code EBME22ID	e: Cour 1 FLUI	Course Name: THERMODYNAMICS AND FLUID MECHANICS										T/SLr	P/R	С
	Prere	equisite	: Basic	Mecha	anical &	Civil E	ngg			Ту	3	0/0	0/0	3
L : Lecture T	: Tutorial	SLr : S	upervis	ed Lear	ming P: F	Project R	: Re	searc	hC:					1
CreditsT/L/E	TL:Theory	y/Lab/E	mbedde	ed Theo	ory and La	ab								
OBJECTIV	ES													
• To u	nderstand	the basi	c Laws	of The	rmodynai	nics and	l the	worki	ing pri	nciple of	f IC l	Engines	5.	
• To u	nderstand	the desi	gn of T	urbines	and boile	ers.								
• To u	nderstand	the prop	perties of	of Fluid	s and imp	lementa	ation	of Hy	/drauli	c machii	nery	& Pum	ps.	
• To k	now the in	nportan	ce, appl	ication	and inter	relation	ship	of var	rious p	oroperties	s of f	fluid		
To st	udy about	various	s types o	of pump	os and tur	bines								
COURSE O	UTCOM	ES (Cos	5)											
Students com	pleting the	is cours	e were	able to										
C01	Capabl Engine	le to un es	Iderstan	d the b	asic Law	s of Th	ermo	dynar	mics a	nd the v	vorki	ing prir	ciple	of IC
CO2	Studen	ts are c	apable	to desig	n turbine	s and bo	oilers	•						
CO3	Studen	its can d	lemonst	rate the	propertie	es of Flu	ids a	ind im	pleme	entation of	of Hy	ydraulio	e mach	inery
<u> </u>	& Pum	ips.	1.1			1'				1.41.41.4		·		
04	of fluid	of fluid Acquire knowledge on various types of pumps and turbines												
CO5	Acquire knowledge on various types of pumps and turbines													
Mapping of	Course O	Irse Outcome with Program Outcome (POs) PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12												
COS/POS	POI	PO2	PO3	PO4	P05	PUo	P	07	PO8	P09	PO	10 PC	,11	POIZ
<u>CO1</u>	3	2	2	1	2	3	3		2	3	1	2		1
<u>CO2</u>	2	2	2	2	1	3	3		2	2	1	1		1
<u>CO3</u>	3	1	2	1	2	2	2		2	3	1	2		1
CO4	2	2	2	3	2	3	3		2	2	2	1		1
	3		1	2	1				2	3				1
COS/PSOS		P50	UI			P5	02				_	PSU3		
CO1		3	6			2	2					2		
CO2		3				2	2					3		
CO3		3				2	2					2		
CO4		3	6			2	2					3		
<u>CO5</u>	<u> </u>	3	1	2 11.	1 2 14	2	2					2		
3/2/1 Indicate	es Strengtr	1 of Cor	relation	n, 3–H1g	gh, 2-Mec	11um, 1-	Low							
ory	isic Sciences	on Eloctivos	oen Elecuves	erdisciplinary		ill Component	Ducioal / Duciaat	acucal / rroject						
iteg	\mathbf{Ba}	En	;	Hı Sc	P_{r}	Pro	(Č	5	Int		Sk		ゴ
Ca														

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Course Name: THERMODYNAMICS AND Ty/Lb/L T/SLr P/R **Course Code:** С EBME22ID1 **FLUID MECHANICS** ETL/IE Prerequisite: Basic Mechanical & Civil Engg Tv 3 0/0 0/0 3

UNIT I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS

Thermodynamics systems, Concepts of continuum, Thermodynamics properties, Equilibrium, Process, Cycle, Work, Heat, Temperature, Zeroth law of thermodynamics. First law of thermodynamics – Applications to closed and open systems – Steady flow Energy Equations – Simple Problems

UNIT II SECOND LAW OF THERMODYNAMICS

Statements, Reversibility, causes of irreversibility, Carnot Cycle, Reversed Carnot Cycle, Heat Engines, Refrigerators, Heat Pumps - Clausius Inequality – Entropy - Principles of increase of entropy - Carnot theorem.

UNIT III POWER CYCLES

Air cycles – Assumptions - Otto, Diesel, Dual and Brayton cycle – Air standard efficiency – Mean effective pressure – Working of two stroke and Four Stroke Petrol and Diesel Engines.

FLUID MECHANICS **UNIT IV**

Fluid properties; fluid statics, manometer, control-volume analysis of mass, momentum and energy; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc.

UNIT V **FLUID MACHINERY**

Introduction, types of pumps - reciprocating pump - centrifugal pump - construction details - working principles, Pelton-wheel, Francis and Kaplan turbines – construction and working principles.

Total No. of Periods :45

TEXT BOOKS

- 1. Nag, P.K. Engineering Thermodynamics, 2nd Edn, Tata McGraw Hill Publishing Company Ltd.
- 2. Rajput R.K., Fluid Mechanics and Hydraulic Machines, S. Chand and Co., India

REFERENCE BOOKS

- 1. Holman, J.P. (1995) Thermodynamics, McGraw Hill.
- 2. Yunus A. Cengel, Thermodynamics-An Engineering Approach., Tata Mc.Graw Hill.
- 3. Bansal R.K., A Text Book of Fluid Mechanics and Hydraulic Machines, S. Chand and Co., India





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Course Code: EBEE22ET3	Course Name: LINEAR AND DIGITAL INTEGRATED CIRCUITS								Ty/ Lb ETL/II	/ L E	T/SLr	P/R	С	
	Prerequisite: Communication Systems and IOT									2	0/0	2/0	3	
L : Lecture T :				I	L									
CreditsT/L/ET	L:Theor	y/Lab/En	nbedded	l Theory	and Lab)								
OBJECTIVES	5													
• To study the	IC fabr	rication pr	rocedur	e.										
• To study characteristics, realize circuits and design for signal analysis using Op-amp ICs.														
• To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator										or				
Circuits, AD	DC													
Familiarity	of differ	ent types	of gates	s using t	ruth table	e with l	ogic c	ircuits.						
• Familiarity t	o use lo	gic gates	in sequ	ential ar	nd combi	nationa	l circu	iits.						
COURSE OU	тсом	ES (Cos)												
Students compl	leting th	is course	were al	ole to										
CO1	Unde	rstands th	ne Elect	ronics D	evices in	n integra	ated fo	orm						
CO2	Desci	Describe the constructional feature of Regulators, Op-Amp, ICs												
CO3	Apply	Apply the basic concept and can fabricate special ICs for better application and reduce the cos											e cost	
CO4	Choo	Choose the appropriate IC for the best solution and infer the societal needs												
CO5	Modi	fy the de	esign o	f combi	national	circuit	s and	apply the	ICs an	d Op	. Amp	to bu	uild a	
	sustai	inable So	ciety											
Mapping of C	ourse O	utcome	with Pr	ogram (Outcome	e (POs)								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO	7 PO8	PO9	PO1	0 PO	11 P	012	
CO1	3	3	3	3	3	3	3	3	3	3		3	3	
CO2	3	3	3	3	3	3	3	3	3	3		3	3	
<u>CO3</u>	3	3	3	3	3	3	3		3	3		3	3	
<u>CO4</u>	3	3	3	3	3	2	2		2	$\frac{2}{2}$		2	2	
<u>CO5</u>	3	3	3	3	3	3	3	<u> </u>						
COs/PSOs	_	PS	01			PS03								
			3			2								
		•	3 2		2				3					
C03			<u> </u>				$\frac{3}{2}$				3			
C04			3				2							
3/2/1 Indicates	Strength	of Corre	lation, (3–High,	2-Mediu	m, 1-L	ow				-			
		ມີເ	v l			-			li		nt			
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	tival e al local control con							sn Stiv	rdi:		np.		stic	
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UNIT I **IC FABRICATION**

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realization of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs

CHARACTERISTICS AND APPLICATIONS OF OP AMP UNIT II

Ideal OP-Amp characteristics, offset voltage and current, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer, differentiator and integrator - Instrumentation amplifier, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit

UNIT III SPECIAL IC'S

555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs

UNIT IV DIGITAL FUNDAMENTALS

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, - Deriving a Boolean equation from truth table - simplification of Boolean functions using K-map & Quine McCluskey method, Implementation of a Boolean function using Logic gates and universal gates.

UNIT V COMBINATIONAL CIRCUITS AND SEQUENTIAL CIRCUITS

Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and de-multiplexers -Function realization multiplexers - Latches-Flip flops - Mealy and Moore Models- Design of Shift Registers and counters (Synchronous and Asynchronous Sequential Circuits)-Hazards

LAB COMPONENT:

- 1. Measurement of Op-Amp Characteristics.
- 2. Op-amp applications I Inverting & Non-inverting amplifier, summer, Multiplier, logarithmic and differential amplifiers, Integrator.
- 3. Op-amp applications –II –Wave form generation, multi-vibrators.
- 4. Voltage controlled oscillator.
- 5. A/D & D/A converters.
- 6. Study and Implementation of Logic gates.
- 7. Design and implementation of code converters using logic gates.
- 8. Design and implementation of 3-bit synchronous up/down counter.
- 9. Implementation of SISO, SIPO, PISO and PIPO shift registers using flip-flops.

Total No. of Periods: 60

32

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TEXT BOOKS

- 1. Ramakant, A. Gayakward, (2003) Op-amps and Linear Integrated Circuits, 6th Edn, Pearson Education PHI.
- 2. Roy Choudhary, D. SheilB. Jani, (2003) Linear Integrated Circuits, 2nd Edn, NewAge.
- 3. Morris Mano, M. (2002) Digital Logic and Computer Design, Prentice Hall of India

REFERENCE BOOKS

- 1. Jacob Milman, Christos C. Halkias, (2003) Integrated Electronics- Analog and Digital circuits system, Tata McGraw Hill.
- 2. Robert F. Coughlin, Fredrick F. Driscoll, (2002) Op-amp and Linear ICs. 4th Edn, Pearson Education, PHI.
- 3. Charles H. Roth, (2002) Fundamentals Logic Design, 4th Edn, Jaico Publishing.
- 4. Floyd, (2003) Digital Fundamentals,8th Edn, Pearson Education.
- 5. John F. Wakerly, (2002) Digital Design Principles and Practice, 3rd Edn, Pearson Education



Course C	Code:	Course Name: ELECTRICAL MACHINES LAB									y /Lb/ TL/IF	L	T/ SIr	P/ R	C
		Propagnisita: DC Maghings and Transformary AC and										•	0/0	2/0	1
		Special Machines									LD	U	U/U	3/0	1
L : Lectur	re T : Tu	utorial	SLr : Su	pervised	l Learn	ing P:	Projec	t R:Re	esearch	C: Cree	lits		1		
T/L/ETL	: Theor	y/Lab/E	mbedded	Theory	and La	ıb									
OBJECT	IVE:														
•	To a	nalyze t	he Interna	al and E	xternal	Load (Characte	eristics f	for DC	Genera -	tors and	Moto	rs		
•	 To determine the speed control using different methods for DC Motor and Generator To find the constant loss and copper loss of DC Machines 														
 To find the constant loss and copper loss of DC Machines To analyze the Load Characteristics of Synchronous machines 															
 To analyze the Load Characteristics of Synchronous machines To find Voltage Regulation of Synchronous machines 															
 To find voltage regulation of Synchronous machines. To study the effect of frequency and voltage control action of Three phase induction machines. 															
COURSE	E OUT	COME	S (Cos): (3-5)						F					
CO	1	Analy	ze the Lo	ad Char	acterist	ics of I	DC Gen	erators	and Mo	otors					
CO	2	Deter	nine diffe	erent me	thods c	of speed	d contro	ol for D	C Macl	nines					
CO	3	Under	stand the	losses in	ncorpo	rated in	DC M	achines							
CO	4	Deter	mine the o	characte	ristics of	of trans	formers	s and in	duction	motors					
CO	5	Under	stand the	basic kr	nowled	ge of a	lternato	rs							
Mapping	Mapping of Course Outcomes with Program Outcomes (POs)														
COs/P	POs	PO1	PO2	PO3	PO4	PC)5	PO6	PO7	PO8	PO9	PO1	0 PC	011	PO12
CO	1	2	2	3	2		1	2	3	2	3	2		3	2
CO	2	2	2	3	2		1	3	2	2	3	2		3	2
CO3 3 3		3	2	2		1	2	3		3	2	-	3	3	
	4	3	3	3	2		2	2	3	2	$\frac{2}{2}$	2		3	1
	5 250c	J P	<u> </u>) P	$\frac{3}{302}$		3 	3	3	Z	3	2		3	3
	<u>505</u> 1	1)	3	$\begin{array}{c c} 1302 \\ \hline 2 \\ \hline 2 \\ \hline \end{array}$											
CO	2		3	$\begin{array}{c c} \hline 2 \\ \hline 2 \\ \hline \end{array}$											
CO	3		3		2		1								
CO	4		2		3		2								
CO	5		3		2		3								
3/2 /1 ind	icates S	trength	of Correl	ation 3	3- High	, 2- Me	edium,	1-Low	r			-		r	
			П												
		ces	ocia												
		ienc	Š	ict It & SV											
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	ienc	PP DDC CO ing ing													
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gor.	asic	ngir	agin ag												
ate	B	Е	Press Sk Int Or Press Sk						-						
С				,											



Course Code: EBEE22L12	Course Name: ELECTRICAL MACHINES LAB	Ty /Lb/ ETL/IE	L	T / S.Lr	P/ R	С
	Prerequisite: DC Machines and Transformers, AC and Special Machines	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS

- 1. Open Circuit Characteristics Of DC Shunt Generator
- 2. Load Characteristics of DC Compound Generator
- 3. Load test on DC Shunt Motor
- 4. Load test on DC Series Motor
- 5. Swinburne's Test
- 6. OC and SC test on Single Phase Transformer
- 7. Load test on Single Phase Transformer
- 8. Load Test on Three Phase Alternator
- 9. Load Test on Three Phase Induction Motor
- 10. Load Test on Single Phase Induction Motor

Total No. of Periods: 45



Course Code: EBEE22006	Course Name: GENERATION, TRANSMISSION AND DISTRIBUTION									T/SLr	P/R	C		
	Prereq	uisite: El	ectromagne	tic field th	neory			Ту	3	0/0	0/0	3		
L:Lecture T:Tutorial SLr: Supervised Learning P:Project R: Research C:														
CreditsT/L/ETL:Theory/Lab/Embedded Theory and Lab														
OBJECTIVE	5													
• To learn about Power system														
• To know about transmission line parameters														
To model the transmission lines														
• To learn about distribution and substation														
• To	know ab	out the fau	ilt and protec	ction										
COURSE OU	TCOME	S (Cos)												
Students comp	leting this	course w	ere able to											
CO1	Recogni	Recognise the various methods of power generation and its functional component												
CO2	Identify	Identify the performance parameters for the power generation and transmission systems												
CO3	Analyze	Analyze various factors which effect the power system structure												
CO4	Describe	e the mech	nanical desig	n, electrica	al desig	n and	the perfor	mance of	the	transmi	ssion	line		
004	along w	ith the sup	porting equi	pments										
CO5 Examine electrical faults and different protective equipments in power system														
Mapping of Course Outcome with Program Outcome (POs)														
COs/POs	PO1	PO2	PO3 PO4	PO5	PO6	PO7	PO8	PO9	PO	10 PO	11 P	012		
COl	3	3	3 3	3	2	3	2	3	2	3		2		
<u>CO2</u>	2	2	$\frac{2}{2}$ 3	2	3		3	3	$\frac{2}{2}$	3		3		
<u> </u>	3	3	$\frac{2}{2}$ 3	2	3	3	3	2	3	3		2		
C04	2	2	$\frac{2}{2}$ 3	3	3	3	2	3	2	3		2		
	3	<u> </u>	$\frac{3}{1}$	3	<u>2</u>		3							
		P50	1		PSO2				r803					
<u>CO1</u>	_	3			2				3					
		2				3				2				
<u> </u>		1				<u> </u>				3				
C04 C05									2					
2/2/1 Indicates	Strength	of Correly	ation 3_Hig	h 2-Medin	1_I	<u></u>				2				
3/2/1 maleates	Sucingui		ation, <u>5–111g</u>		1111, 1-L	.0 w		.=		It				
	s	ring string		_	_	ş	ş	cipl		l ner	1/			
	Soc ani; ces			ran	ran	tive	n live	dis		Skil	ica	sct		
ory	asi(cier	asic cier ngi um um		rog ore	rog rog		per lect	uter ary	jon j		ract roje			
teg	Х В	<u> ш х</u>	N ar H	<u> </u>	Ъ			н не				년 년		
Ca				N										
3. Arun Ingole (2017) Power Transmission and distribution. Pearson Education. 4. Chakrabarti, A. Soni, M.L. Gupta, P.V. Bhatnagar, U.S. (2002) A Text Book on Power System Engineering. Dhanpat Rai & Co. Pvt. Ltd

REFERENCE BOOKS

- 1. Patra, S.P. Basu, S.K. and Chowduri, S. (1983) Power systems Protection. Oxford and IBH
- 2. Sunil S. Rao, (1986) Switchgear and Protection. New Delhi: Khanna Publishers
- 3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi

Transposition of Lines - Concepts of GMR and GMD - Skin and Proximity Effects **UNIT IV** 9 MODELLING AND PERFORMANCE OF TRANSMISSION LINES Classification of lines – short line, medium line and long line – equivalent circuits, phasor diagram, attenuation constant,

and Double circuits - Solid, Stranded and Bundled Conductors - Symmetrical and Unsymmetrical Spacing -

phase constant, surge impedance; transmission efficiency and voltage regulation, real and reactive power flow in lines,

UNIT III TRANSMISSION LINE PARAMETERS Parameters of Resistance, Inductance and Capacitance calculations - Single and three phase transmission lines - Single

DISTRIBUTION

Power - circle diagrams, surge impedance loading, methods of voltage control; Ferranti effect

Feeders, distributors and service mains – DC distributor – 2-wire and 3-wire, radial and ring main distribution - AC distribution - single phase and three phase 4-wire distribution - Substation - Classification, functions and major components - sample substation layout

TEXT BOOKS

2002

Course Code:

EBEE22006

UNIT I

UNIT II

- 1. V. K. Mehta, "Principles of Power Systems", S. Chand, New Delhi, 2005
- 2. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi,

UNIT V DISTRIBUTION SYSTEM AND SUBSTATIONS

Total No. of Periods:45

Wind, Biomass, Geothermal, Tidal – Structure of Electrical Power System – Different operating Voltages 9

9

P/R

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Ty/ Lb/

ETL/IE

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Conventional sources of energy – Thermal, Nuclear, Diesel, Gas etc – Non-conventional Sources of Energy – Solar,

Mechanical design of OH lines- Line Supports - Types of Towers - Stress and sag calculation - Effects of wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of

MECHANICAL DESIGN OF LINES, CABLES AND INSULATORS

insulators, Underground cables: Construction, Classification, Capacitance of 2 core and 3 core cables

Course Name: GENERATION, TRANSMISSION AND

Prerequisite: Electromagnetic Field Theory

INTRODUCTION TO POWER SYSTEM



Course Code: EBEE22008	Course I	Course Name: CONTROL SYSTEM Ty/ Lb/ ETL/IE L T/SLr P/R C															
	Prerequ	isite: La	aplace	and Fou	irier Tra	nsform	IS		Ty	3	1/0	0/0	4				
L: Lecture T: Tu	itorial SLr	: Superv	vised Le	earning I	P: Project	R: Res	earch	C: Credit	8								
T/L/ETL: Theor	y/Lab/Em	bedded	Theory	and Lat)												
UDJECTIVES		a haaia .		anta of													
• Und	erstand the	e basic (compon lome in	time do	control sy	roculon	w dom	noin									
• Cap • Und	aute to sur	e freque	nev res	nonse fo	or the stab	ility of	the sv	idili stem									
• Und	lorstand th	e neque	nt of Co		tore	Jinty OI	the sy	stem									
• Und	erstand th	e State s	snace A	nalvsis <i>d</i>	of differen	nt varia	bles										
COURSE OUT		Cos)	spuee 11	1111 y 515 V	of unitered		10105										
Students comple	eting this c	ourse w	ere able	e to													
CO1	Summari	ze the f	undame	ental cor	ncepts of a	control	systen	ıs									
CO2	Employ t	time dor	nain an	alysis to	predict a	and diag	gnose t	ransient j	performa	nce par	ameters	s of th	e				
CO3	Illustrate	stem for standard input functions ustrate the time and frequency-domain responses of any control system and will be able to focus															
	on stabili	stability of a closed-loop control system															
CO4	Identify t dynamic	dentify the needs of different types of controllers and compensator to ascertain the required lynamic response from the system.															
CO5	Create va	arious co	ontrol s	ystem aj	pplication	is relate	ed to in	dustries									
Mapping of Co	urse Outc	ome wi	th Prog	gram Ou	utcome (l	Pos)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	P	012				
<u>CO1</u>	3	3	2	2	3	3	1	2	2	2	3		3				
	3	3	3	3	3	2	2	2	2	1			2				
	3	3	3	3	3					L			2				
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	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$												2				
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COS/PSOs CO1 CO2	3	$ \begin{array}{r} 2 \\ 3 \\ \hline PSC \\ \hline 3 \\ \hline 2 \end{array} $	$\frac{\frac{2}{3}}{2}$	3	3 3	2 2 3 PS	$\begin{array}{c} 1 \\ 1 \\ 3 \\ 02 \\ 2 \\ 3 \end{array}$	1 3	2 3	1 3 P	$ \begin{array}{c c} 1 \\ 1 \\ 3 \\ \hline \\ \hline \\ \\ \hline \\ \\ \\ \hline \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $		23				
COS COS/PSOS CO1 CO2 CO3	3	2 3 PSC 3 2 2	2 3)1	3	3 3	2 3 PS	1 1 3 02 2 3 2		2 3	1 3 P	$ \begin{array}{c c} 1 \\ 1 \\ 3 \\ \hline 1 \\ \hline $		2 3				
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COSCOs/PSOsCO1CO2CO3CO4CO5	3	$ \begin{array}{r} 2\\ 3\\ PSC\\ \hline 3\\ \hline 2\\ \hline 2\\ \hline 3\\ \hline 2\\ \hline 3\\ \hline 2 \end{array} $	2 3 D1	3		2 3 PS	1 1 3 02 2 3 2 3 2 2		3	1 3 P	$ \begin{array}{c c} 1 \\ 1 \\ 3 \\ \hline 3 \\ \hline 3 \\ \hline 3 \\ \hline 2 \\ \hline 3 \\ \hline $		2 3				
COS COS/PSOS CO1 CO2 CO3 CO4 CO5 3/2/1 Indicates S	2 3 trength of	2 3 PSC 3 2 2 3 2 Correlat	2 3 D1	3 3	3 3	2 3 PS ,1-Low	1 1 3 02 2 3 2 3 2 3 2 7			1 3 P	$ \begin{array}{c c} 1 \\ 1 \\ 3 \\ \hline $		2 3				
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COS COS/PSOS CO1 CO2 CO3 CO4 CO5 3/2/1 Indicates S	trength of	2 3 PSC 3 2 2 2 3 2 Correlat	2 3 D1 tion, 3-	High, 2-	3 3 -Medium	2 3 PS ,1-Low	1 1 3 02 2 3 2 3 2 7 7	1 3	2 3	1 3 P	1 1 3 3 3 3 2 3 3						
COS COS/PSOS CO1 CO2 CO3 CO4 CO5 3/2/1 Indicates S	trength of	2 3 PSC 3 2 2 2 3 2 Correlat	2 3 D1 tion, 3-	High, 2- High, 2-	3 3 -Medium	2 3 PS ,1-Low	1 1 3 02 2 3 2 3 2 7 7 7 7 7 7 7 7 7 7 7 7 7	Ilectives	2 3	1 3 P	1 1 1 3 3 3 2 3						
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Total No. of Periods:60

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A DOLLAR	LIDUCATIONAL AND RESEARCH INSTITUTE DEEMED TO BE UNIVERSITY University with Graded Autonomy Status (An ISO 21001 : 2018 Certified Institution) Periyar E.V.R. High Road, Maduravoyal, Chennal-95. Tamilnadu, India.	NAAC ****

Course Code: EBEE22008	Course Name: CONTROL SYSTEM	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С
	Prerequisite: Laplace and Fourier Transforms	Ту	3	1/0	0/0	4

UNIT I INTRODUCTION TO CONTROL SYSTEMS COMPONENTS

Open and closed loop Systems - mathematical models of physical systems - differential equations - transfer function - armature control - field control - block diagram reduction - signal flowgraphs

UNIT II TIME RESPONSE ANALYSIS

Standard test signals – time response of first order – second order systems-steady state errors and error constants

FREQUENCY RESPONSE AND CONCEPT OF STABILITY **UNIT III**

Bode plot, polar plot, Nyquist Stability-Concept of stability-necessary conditions-Hurwitz stability criterion-Routh stability criterion-relative stability analysis.

UNIT IV INTRODUCTION TO DESIGN OF COMPENSATORS

Realization of basic compensators-lag, lead, lag-lead. Introduction to P, PI, PD, PID controllers, tuning of PID controllers

UNIT V STATE SPACE REPRESENTATION

Concept of state-State Variable representation-conversion of state variable models to transfer functions- Conversion of transfer function to state variable models – Solution of state equations – Concepts of controllability and observability.

TEXT BOOKS

- 1. Nagrath,L.J.Gopal,M.(2017) Control System Engineering. 6th Ed. Newage International (P) Ltd Publishers.
- 2. Ogata, K. Modern Control Engineering-analysis of system dynamics, system design using Root Locus. 4thEd. Prentice Hall for practice and solutions.

REFERENCE BOOKS

1. www.GaliLMc.com-GALIL we move the world-featured tutorials-motion controllers, tuning servo systems, adjustment of PID filter.



Course C EBEE220	ode: 03	Course Name:MEASUREMENTS ANDTy/ Lb/LINSTRUMENTATIONETL/IE												C	
		Prerec Instru	luisite menta	: Basic tion En	Electri	ical, Eleo ng	ctronics	and		Ту	3	0/0	0/0	3	
L : Lecture	e T : 1	Futorial	SLr	Superv	vised Le	arning H	P : Proied	ct R : Resea	arch C	: Credits				<u> </u>	
T/L/ETL :	Theo	ry/Lab/I	Embed	ded The	eory and	l Lab	J								
OBJECT	IVE:														
• To une	dersta	nd the N	leasur	ement a	nd cont	rol conce	epts.								
• Studen	nts wi	ll obtain	know	ledge at	out diff	ferent typ	pes of Tr	ansducers, l	oridge	s and its C	haracteri	stics.	_		
• To cal	librate	energy	meters	s in a sir	ngle pha	ise, three	phase a	nd measure	the po	wer, iron l	oss and j	power	factor	•	
• To far	niliari	ze the st	the students with different storage and display devices.												
• To fail		COME	MES (Cos): (3-5)												
C01		Ability	bility to understand the concept of measurement and control												
CO2		Unders	inderstand the operation of different measuring instruments												
CO3		Knowl	nowledgeable on different types of transducers, bridges and amplifiers												
CO4		Acquir	e knov	vledge (on diffe	rent type	s of osci	lloscopes							
CO5		Apply engine	the kno ering a	owledge and tech	e of vari nology	ous instr	uments t	o measure th	ne phy	sical quant	ities in tl	ne field	d of sc	ience,	
Mapping	of Co	urse Ou	itcome	es with	Progra	m Outco	omes (PO	Os)							
COs/PO	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO	11	PO12	
C01		3	3	3	3	3	3	3	2	3	2		3	3	
CO2		2	2	2	2	2	2	2	2	2	1	3	3	1	
CO3		3	3	3	3	3	3	3	2	2	2	3	;	1	
CO4		2	2	2	2	2	2	2	2	2	2	2	2	3	
CO5	0	3	3	3	3	3	3	3	2	3	2	3	,	1	
COs/PS	Os	PSC)1	PS	<u>802</u>	PS	<u>803</u>					_			
		2			2 1		<u>3</u> 1								
CO2		1			<u> </u>		2								
CO4		3			3		2								
CO5		2			2		3								
3/2/1 India	cates S	Strength	of Co	rrelatior	n 3-H	igh, 2- N	ledium,	1-Low							
tegory	Basic Sciences	Engineering Sciences	Engineering Sciences Humanities and Social Sciences Program Core Program Core Den Electives Skill Component Practical / Project												
Cai					V										

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Course Code: EBEE22003	Course Name: MEASUREMENTS AND INSTRUMENTATION	Ty/ Lb/ ETL/IE	L	T/S Lr	P/ R	C
	Prerequisite: Basic Electrical, Electronics and Instrumentation Engineering	Ту	3	0/0	0/0	3

UNIT I **INTRODUCTION TO MEASUREMENTS**

Basic elements of Instruments-Principles and types of analog and digital voltmeters, ammeters- Static and dynamic characteristics - Errors in measurements - Standards and calibration

CURRENT, POWER AND ENERGY MEASUREMENTS UNIT II

Power and Energy measurement – Instrument transformers – Current and Potential Transformers – Dynamometer and Instruments, kVAh and kVARh meters

UNIT III **METHODS OF MEASUREMENTS**

D.C& A.C potentiometers - D.C & A.C bridges - transformer ratio bridges - self - balancing bridges - PMMC, moving iron - Electrostatic and Electromagnetic interference-Grounding techniques - Calibration

UNIT IV BRIDGES AND THEIR APPLICATIONS

D.C bridges: Wheatstone, Kelvin and Kelvin Double bridge – A.C bridges: Maxwell, Wein, Anderson and Schering bridges – Errors, limitations and applications of each bridge.

UNIT V STORAGE AND DISPLAY DEVICES

Magnetic disc and Tape Recorders –Digital plotters and printers - CRT displays - Digital CRO – LED, LCD and Dot matrix displays - Data Loggers.

Total No. of Periods: 45

TEXT BOOKS

- 1. A.K. Sawhney (2015) A Course in Electrical and Electronic Measurements and Instrumentation. 9th Ed. Dhanpat Rai & Co.
- 2. Kalsi H.S. (2010) Electronic Instrumentation. 3rd Ed. Tata McGraw Hill Publications.
- 3. Bouwens A.J (2010) Digital instrumentation. 16th Reprint, Tata McGraw Hill Publications.

REFERENCE BOOKS

- 1. Rangan C.S (2009) Instruments Devices and System. 2nd Ed. Tata McGraw Hill Publications.
- 2. W.D. Cooper (2009) Electronic Instrumentation and Measurement Techniques. 1st Ed. Prentice Hall of India Publications.





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Course Code: EBEE22ET4	Course MACH	e Name: HINES	: DESIC	GN OF 1	ELECTI	RICAL			Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С									
	Prereq Specia	uisite:] Machi	DC Ma	chines a	nd Tran	sforme	ers, A(C and	ETL	2	0/0	2/0	3									
L · Lecture T ·	Tutorial S	SLr · Su	nervised	Learni	ng P· Pro	iect R ·	Resea	$rch C \cdot C$	redits													
T/L/ETL:Theor	v/Lab/Er	nbedded	l Theory	and La	.b	jeet R.	Reset		icuits													
OBJECTIVES	5				-																	
• The	graduate	will be	capable	of desig	gning the	transfo	rmers															
 Το ι 	inderstan	the dea	signing	the roto	r bars & s	slots.																
• The	graduate	will be	capable	of desig	gning mad	chine pa	aramet	ers relate	d to the I	ndust	rial nee	ds.										
• The	graduate	will be	capable	of desig	gning the	Electric	cal ma	chines														
 Το ι 	Inderstan	d the cha	aracteris	stics like	e speed, to	orque et	tc. of c	lifferent e	electrical	mach	ines.											
COURSEOUT	COMES	(Cos)																				
Students compl	eting this	course	were ab	le to																		
CO1	Classif	y and de	esign pro	oper ma	terials for	r electri	cal ma	achines														
CO2	Design of basic dimensions for the electrical machines in cost effective manner																					
CO3	Estimate the performance characteristics of various electrical machines for the complex																					
	engineering problems																					
CO4	Acquir	Acquire knowledge to carry out a detailed design of a electrical machines and estimate the performance indices																				
	perform	nance in	idices		1			•	1	C 1. 1 . 1.			1.1									
COS	Design	a simpl	e machi	ne to ca	ter the te	mperati	are rise	e issue in	design of	t high	rated a	nd hig	gnly									
Manning of C	urse Ou	tcome y	nes vith Pro	oram (Dutcome	(POs)																
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	/ PO8	PO9	PO1		11	PO12									
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CO2	2	3	2	2	3	3	2	3	3	2	2		3									
CO3	3	2	3	3	2	3	3	3	3	2	3		3									
CO4	3	3	2	2	2	-	-	-	-	_	2		2									
CO5	-	-				2	2	2	2	3	3		_									
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CO3/PSOs CO1 CO2 CO3		1 PS 2 3	1 01 2 3	2		2 3 PS	2 1 02 3 3 3	2 3	2 3	3 2	$\frac{1}{3}$	I	2									
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CO3 /PSOs CO1 CO2 CO3 CO4 CO5 3/2/1 Indicates	Strength o	1 PS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1 01 2 3 2 3 1 1 1 1 1 1 1 1 1 1 1 1 2 3 3 1 1 2 3 1 2 3 1 1 2 3 3 1 1 2 3 3 1 1 3 3 1 1 3 3 1 1 3 3 1 1 3 3 1 1 3 3 1 1 1 3 3 1 1 1 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 -High, 1 -High, 2 Solution	2-Mediun	2 3 PS 3 2 3 2 3 2 3 2 3 2 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3	2 1 02 3 3 3 2 3 3 WW	2 3	2 3 	3 2	PSO3 3 2 3 2 1 1											
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CO3 /PSOs CO1 CO2 CO3 CO4 CO5 3/2/1 Indicates	2 Strength o	1 PS S S S S S S S S S S S S S S S S S S	1 01 2 3 2 3 1 1 1 1 1 1 1 1 1 1 1 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 1 3 1 2 3 1 2 3 1 1 3 1 1 1 1	2 2 Sciences	Jogram Core	2 3 PS 3 m, 1-Lo Hectives	2 1 02 3 3 3 2 3 3 WW	Den Electives	2 3 uterdisciplinary		2 3 2 1 1		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2									
CO3 /PSOs CO1 CO2 CO3 CO4 CO5 3/2/1 Indicates	Basic Sciences	1 PS C C C C C C C C C C C C C C C C C C	1 01 2 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 3 1 1 1 2 3 1 1 2 3 1 1 2 3 1 1 2 3 1 1 2 3 1 1 2 3 1 1 2 3 1 1 1 3 1 1 1 1	2 2 Sciences and Social Sciences	J 1 2-Medium √	2 3 PS 3 m, 1-Lo H merour	2 1 02 3 3 3 2 3 3 9 W	Open Electives	2 3 Interdisciplinary		Skill Component 3 2 3 2 1		Lactical / Project									

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Course Code: EBEE22ET4	Course Name: DESIGN OF ELECTRICAL MACHINES	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С
	Prerequisite: DC Machines and Transformers, AC and Special Machines	ETL	2	0/0	2/0	3

UNIT I **INTRODUCTION**

Major considerations-Limitations-Space factor temperature gradient-Heat flow in two dimensions-Thermal resistivity of winding- Temperature gradient in conductors placed in slots

DC MACHINES UNIT II

Magnetic circuit calculations-Net length of Iron-Real & Apparent flux densities-D.C machines output equations –Design of shunt and series field windings–Design of Commutator and brushes.

UNIT III **TRANSFORMERS**

KVA output for single and three phase transformers–Window space factor–Temperature rise of Transformers -Design of Tank with & without cooling tubes-Conservator-Breather

INDUCTION MOTORS UNIT IV

Magnetic leakage calculations-Leakage reactance of poly-phase machines-Output equation of Induction motor -circle diagram-Dispersion co-efficient- relation between D&L for best power factor.

UNIT V SYNCHRONOUS MACHINES

Runaway speed-construction-output equations-choice of loadings-Design of salient pole machines-Short circuit ratio-Introduction to computer aided design-Program to design main dimensions of Alternators.

Lab Components:

1. Case study and Design of any one of the machines with prototype.

TEXT BOOKS

- 1. Sawhney, A.K.& Chakrabarti, A (2010) A Course in Electrical MachineDesign.6th Ed. Dhanpat Rai & Sons, New Delhi.
- 2. Deshpande M V (2011) Design and testing of Electrical Machines, PHI learning Pvt. Ltd.

REFERENCE BOOKS

- 1. Sen, S.K. (2006) Principles of Electrical Machine Designs with Computer Programmes. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
- 2. Shanmuga sundaram et. al (2011) Design data Handbook, 1st Ed. New Age International



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Cours Code:	se	Course	Name: ME	ASU	REME	NT A	ND (CONTR	ROLL	AB	Ty/ Lb/ ETL/IE	L	T / S.Lr	P / R	С
EBEE	22L13	Prereq	uisite: Meas	surem	ents an	ıd In	strun	nentatio	on, Cor	ntrol	Lb	0	0/0	3/0	1
		System	s												
L:Le	cture T :	Tutorial	SLr : Sup	ervised	l Learn	ing	P: Pro	oject R	: Rese	arch C:	Credits				
T/L/E	TL : The	eory/Lab/	Embedded 7	Theory	and La	ab									
OBJE	CTIVE	:													
	• To	o understa	and the Mea	surem	ent and	cont	rol co	ncepts							
	• St	udents w	ill obtain kn	owled	ge abou	ıt dif	ferent	types of	of Trans	ducers	, bridges a	nd its	charac	teristi	cs.
	• To	o calibrat	e energy me	eters in	ı single	e pha	use, the	ree pha	se and	measu	re the pov	ver, iro	on loss	and 1	power
	fa	ctor.						1			• •				C .
	• To us	o familiar ing simul	ize the stude lation packa	ents w ge suc	ith the h as LA	meas \BVI	sureme [EW /]	ent of lo	ow resi AB etc.	stance,	inductanc	e and	capaci	tance-	factor
COUI	RSE OU	TCOM	ES (Cos): (3	-5)											
CO1	Studen	tudents get familiarized about different types of Transducers, bridges and its characteristics.													
CO2	Unders	Inderstands the concept of calibration of energy meters in single/three phase and measure the power													
CO3	The stu	students gets familiarized with the measurement of low resistance, inductance and capacitance-factor													
	using s	imulation packages etc.													
CO4	Attaine	ed knowle	knowledge on P/I and I/P Converters												
CO5	Attaine	ed knowle	edge on Sma	irt Tra	nsducer	rs									
Марр	ing of C	Course O	utcomes wit	th Pro	gram (Outc	omes	(POs)							
COs	/POs	PO1	PO2	PO3	PO4	P	'05	PO6	PO7	PO8	PO9	PO1	0 PO)11	PO12
C	01	2	1	3	2		3	2	3	2	3	2		3	3
C	02	2	1	2	3		3	3	3	2	2	1		3	2
C	03	1	2	3	3		3	3	3	3	3	3		3	1
C	04	2	3	3	3		3	3	3	3	3	3		3	2
C	05	3	2	3	3		3	1	3	1	3	2		3	2
COs /	' PSOs	Р	SO1	P	SO2		PSC	03							
C	01		2		3		3	5							
C	02		3		3		3	5							
C	03		3		3		3								
C	04		3		3		3	5							
C	05		1		2		3								
3/2/11	ndicates	Strength	OfCorrelati	on,3–l	ligh,2-l	Medi	ium,1-	Low							
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	es			e	ctiv	/es	oje	dill							
	enc	ing	es al	Col	Ele	ctiv	$/P_1$) SC /	s						
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Course Code: EBEE22L13	Course Name: MEASUREMENT AND CONTROL LAB	Ty/ Lb/ ETL/IE	L	T/ S.Lr	P/ R	С
	Prerequisite: Measurements and Instrumentation, Control Systems	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

- 1. Study of temperature measuring transducers (Thermocouples).
- 2. Study of displacement and pressure transducers (LVDT)
- 3. Measure the stress and strain using strain gauge.
- 4. AC Bridges.
- 5. DC Bridges.
- 6. Calibration of Single-phase Energy meter.
- 7. Calibration of Three-phase Energy meter.
- 8. Transfer function of self-excited DC Generator
- 9. Transfer function of Armature controlled DC Motor.
- 10. Transfer function of Field controlled DC Motor.
- 11. Transfer function of AC Servomotor.



Course Code: EBEE22007	Course Name: POWER SYSTEM PROTECTION ANDTy/Lb/LT/SLrP/RCSWITCHGEARETL/IEIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII<												
	Prereq	uisite: (Generat	ion, Tr	ansmiss	ion and	Distri	oution	Ту	3	0/0	0/0	3
L: Lecture T: Tu	torial SL	r: Super	vised L	earning	P: Proje	ect R: Re	esearch	C: Cred	lits	1 1		1 1	
T/L/ETL: Theor	y/Lab/Er	nbedded	l Theory	y and La	ıb								
OBJECTIVES			-										
• To a	ttain kno	owledge	about th	he basic	principl	les of Re	elay						
• To k	now abc	out the ap	pparatus	s protec	tion								
• To a	ttain kno	owledge	on Nun	nerical r	elays, C	ircuit br	eakers						
• To r	nodel the	e power	system	compon	ients								
• To l	earn abo	ut the w	orking p	orinciple	e of relay	ys, circu	it break	ers and	various p	ower	system c	compo	onents
COURSEOUT	COMES	(Cos)											
Students comple	ting this	course v	were abl	le to									
CO1	Recogn	ize the I	Protectio	on circu	its and p	ower sy	stem co	omponer	nts				
CO2	Summarize the operation of relays, circuit breakers and power system components												
CO3	Model t	Model the protective devices, Generator, Transformer, Transmission line, Load representation etc.											
CO4	Design	the relay	vs and r	ower sy	vstem co	mponen	ts						
C05	Paraphi	ase the	working	nrincir	le of rel	ave circ	uit bre	akers an	d various	now	er system	com	nonents
Manning of Co	urse Out	tcome w	vith Pro	oram (Jutcome	(\mathbf{POs})	un bre	ikers an	u various	pow	er system	com	ponents
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO	10 PO1	1	PO12
CO1	3	2	3	2	3	2	2	3	3	3	3	-	3
CO2	2	2	3	2	3	2	2	3	2	3	3		3
CO3	2	3	2	2	3	3	3	2	1	2	2		2
CO4	3	2	3	3	3	2	2	3	2	3	3		3
CO5	2	3	2	3	2	3	3	3	3	2	2		2
COs/PSOs		PS()1			PS	02				PSO3		
CO1		3					<u>,</u>				2		
CO2		2				2	2				3		
CO3		3				3	;				2		
CO4		2				2	2				3		
CO5		3				3	;				1		
3/2/1 Indicates St	trength o	f Correl	ation, 3	–High, ź	2-Mediu	m, 1-Lo	W						
	c Sciences	ineering Sciences	onitiae and Social	nces	gram Core	rram Electives		n Electives	disciplinary		l Component		tical / Project
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Categ		Щ		l N				0			S		<u>д</u>



SWITCHGEAR

UNIT I **PROTECTION SCHEMES**

Principles and need for protection schemes-nature and causes of faults- types of faults-Methods of grounding-Zones of protection and essential qualities of protection-protection scheme

UNIT II RELAYS

Course Code:

EBEE22007

Operating Principles of relays - Common relay terms - Universal Torque Equation. - Electromagnetic relays, Induction relays -Over current relays-Directional, Distance, Differential and negative sequence relays

UNIT III **APPARATUS PROTECTION**

Generator Protection - Motor protection - Bus bar protection and Transmission line and Feeder protection - CT and PT protection

UNIT IV STATIC AND NUMERICAL RELAYS

Static relays - components of static relays - over current relays, differential protection and distance protection -Microprocessor based relays-Block diagram of Numerical relays

UNIT V **CIRCUIT BREAKERS**

Arc phenomena- arc interruption- Current zero interruption theories- recovery voltage and restriking voltage - RRRV

- current chopping - Resistance switching- Various types of circuit breakers - selection and Testing of circuit breakers

– Fuses– HRC fuses

TEXT BOOKS

- 1. V.K. Mehta, "Principles of Power Systems", S. Chand, NewDelhi,2005
- 2. Ravindranath, B.and Chander, N. (2011) Power System Protection and Switchgear, New Age International (P) Ltd
- 3. Chakrabarti, A. Soni, M. L. Gupta, P. V. Bhatnagar, U. S. (2002) A Text Book on Power System Engineering. Dhanpat Rai & Co. Pvt. Ltd
- 4. Arun Ingole (2017), Switch Gear and protection, Pearson Education.

REFERENCE BOOKS

- 1. Patra, S.P. Basu, S.K. and Chowduri, S. (1983) Power systems Protection. Oxford and IBH
- 2. SunilS. Rao, (1986) Switchgear and Protection. New Delhi: Khanna Publishers
- 3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi

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Course Name: POWER SYSTEM PROTECTION AND

Prerequisite: Generation, Transmission and Distribution



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Course Code: EBEE22009	Cour	se Name:	POWER	ELECT	RONIC	S		Ty E1	7/ Lb/ FL/IE	L	T/SLr	P/R	С	
	Prer	equisite: B	asic Elect	trical, El	ectronic	s and			Ту	3	0/0	0/0	3	
L: Lecture T: Tu	itorial	SLr · Super	vised Lea	rning P	Project I	R · Res	earch C	• Credits	T/L/ET	Ί.·				
Theory/Lab/Eml	bedded	l Theory an	d Lab		110jeet 1		euren e	· create	, 1, 2, 21	_ .				
OBJECTIVES		J												
• 7	To attai	n Power E	lectronic I	Devices a	nd its ch	aracter	ristics.							
• T	To desi	gn the trigg	gering of f	iring circ	cuits.									
• T	To lear	n the invert	ers, chopp	pers and l	Industria	l drive	s.							
• T	lo attai	n knowled	ge on DC	& AC D	rives									
COURSE OUT	COM	ES(Cos)	vere able t	0										
CO1	Recognize the various Power Electronic Devices and its switching characteristics													
CO2	Understand various operation and characteristics performance of power converter circuits													
	Anal	Analyze and design various power convert or circuits and to select suitable devices by assessing the												
CO3	requi	requirement of application field												
CO4	Exan	Examine power electronic design at the system level and assess the performance												
CO5	Artic	ulate the us	age of Po	wer Elec	tronic D	evices	in comr	nercial a	nd indus	trial a	pplicatio	ns.		
Mapping of Co	urse C	utcome wi	ith Progra	am Outc	ome (PC	Os)					II ·····			
COs/POs	PO	1 PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	10 PC	011	PO12	
CO1	3	1	1	1	1	2	2	3	1	2		3	3	
CO2	3	2	2	2	1	3	3	3	3	2		2	3	
CO3	3	3	3	3	3	3	3	3	3	2	2	3	3	
CO4	3	3	3	3	3	3	3	3	3	2	2	3	3	
CO5	3	3	3	3	3	3	3	3	3	2	2	3	3	
COs/PSOs		PS	01			PS	SO2				PSO3			
CO1		,	2				2				3			
CO2			3				3				3			
CO3			3				3				3			
CO4			3				3				3			
CO5			3				3				3			
3/2/1 Indicates S	trength	n of Correla	tion, 3–H	igh, 2-M	edium, 1	-Low			n					
ategory		Basic Sciences	Engineering Sciences	Humanities and Social Sciences	∠ Program Core		Program Electives	Open Electives	Interdisciplinary		Skill Component	- - - -	Fracucal / Froject	
1 1 1	1	H K H K K H K K K K												

UNIT I POWER SEMICONDUCTOR DEVICES

Instrumentation Engineering

Course Name: POWER ELECTRONICS

Prerequisite: Basic Electrical, Electronics and

Power semiconductor devices Overview: Characteristics of power Structure, operation, Static characteristics and switching characteristics (Turn on and Turn off) of SCR, TRIAC, BJT, MOSFET and IGBT-Two transistor model of SCR - Series and Parallel operation of SCR - Turn on circuits for SCR - Different techniques of commutation-Protection of Thyristors against over voltage, over current, dv/dt and di/dt

UNIT II PHASE CONTROLLED CONVERTERS

Single phase and three phase half controlled and fully controlled rectifiers with R, RL and RLE loads–Waveforms of load voltage and line current – Inverter operation of fully controlled converter – harmonic factor, power factor, ripple factor, distortion factor – operation with freewheeling diode – effect of source inductance –dual converter.

UNIT III **INVERTERS**

Course Code:

EBEE22009

Voltage and current source inverters – Single phase and three phase inverters (both 120° mode and 180° mode) inverters - PWM techniques: Sinusoidal PWM, modified sinusoidal PWM -multiple PWM - Resonant series inverter -current Source Inverter – UPS

UNIT IV DC TO DC CONVERTERS

Step-down and step-up chopper- control strategy-Introduction to types of choppers-A, B, C, D and E-switched mode regulators-Buck, Boost and Buck-Boost regulator, Introduction to Resonant converters, Applications-Battery operated vehicles.

UNIT V AC TO AC CONVERTERS

Single phase and Three Phase AC voltage controllers- Control strategy- Power Factor control-Multi stage sequence control- single phase and three phase cyclo converters- Introduction to Matrix converters, Applications-Welding.

TEXT BOOKS

- 1. Rashid, M.H. (2017) Power Electronics-Circuits Devices and Applications. 4th Ed. Prentice Hall of India.
- 2. Bimbhra, P.S. (2018) Power Electronics. 4th Ed. Khanna Publishers.

REFERENCE BOOKS

- 1. Singh, M.D. Kanchandani, (2002) Power Electronics. New Delhi: Tata McGraw Hill & Hill publication Company Ltd.
- 2. Dubey, G.K. Doradia, S.R. Joshi, A. Sinha, R.M. (1986) Thyristorised Power Controllers. Wiley Eastern Limited.
- 3. Lander, W. (1993) Power Electronics. 3rd Ed. McGrawHill and Company.

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Total No. of Periods: 45

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Course Code: EBEE22ET5	Course Nat MICROC(me: MI ONTRO	CROF DLLEF	PROCES	SSOR, ARM PR	OCES	SOR		T E	y/ Lb/ FL/IE	L	T/SLr	P/R	C	
	Prerequis Instrume	ite: Bas	ic Eleo Engin	ctrical, l	Electroni	cs and]	ETL	2	0/0	2/0	3	
L : Lecture T :	Tutorial SL	r : Supe	rvised	Learnin	g P: Proj	ect R :]	Resear	ch (C : Cre	dits				<u> </u>	
T/L/ETL:Theo	ory/Lab/Emb	bedded 7	Theory	and Lat))										
OBJECTIVE	S														
• To • In • To • To • To	o understand iterfacing of o know the p o understand o make prog	erfacing of peripheral devices using 8085. know the program Assembly language in Microcontroller understand simple programming using ARM processor make program using KEIL software. FCOMES(Cos) leting this course were able to													
COURSEOU Students comr	TCOMES(0	COS)	ere ahl	le to											
	Estimato S	Simple of	rithmo	tic oper											
	Estimate S				faai										
		e conce		mcropro	Taci	ng dev	ices								
<u> </u>	Explain Si	mple ar	ithmet	ic operat	con	rollers									
<u>CO4</u>	Categorize	e various	s appli	cations of	of microp	rocesso	r								
CO5	Organize t	he conc	ept of	ARM pr	ocessors	& its in	terfac	ings							
Mapping of C	Course Outc	ome wi	th Pro	gram O	utcome ((POs)			200		-	10			
COs/POs	PO1	PO2	<u>PO3</u>	<u> PO4</u>	PO5	PO6	<u>PC</u>)7	PO8	<u>PO9</u>	PO	10 PC	011	PO12	
	3	2	3	3	2	2	3		3	3	1	3		3	
	3	2	<u> </u>	2	3	3	3		3	3	2	3		3	
$\frac{\text{CO3}}{\text{CO4}}$	3	23	2	2	3	3	3		3	$\frac{3}{3}$	2	3		3	
	3	3	3	3	3	3	3		3	3	2	3		3	
COs/PSOs	5		1	5		PS	502		5	J]	PSO3			
CO1		3					2					2			
CO2		2					3					3			
CO3		2					3					3			
CO4		3					3					3			
CO5		3					3					3			
3/2/1 Indicates	Strength of (Correlat	ion, 3-	-High, 2-	-Medium	, 1-Low	7								
egory	Basic Sciences	Engineering Sciences		Humanities and Social Sciences	Program Core				Open Electives	Interdisciplinary		Skill Component		Fractical / Froject	
Cat					N										



Basic ARM architecture – ARM assembly language program – ARM organization and implementation– The ARM instruction set - The thumb instruction set - ARM CPU cores

LAB COMPONENTS:

- 1. Multi precision addition / subtraction / multiplication / division.
- 2. Programming with control instructions
- 3. Increment / Decrement, Ascending / Descending order, Maximum / minimum of numbers.
- 4. A/D Interfacing, D/A Interfacing, Traffic light controller Step motor and key board interfacing.
- 6. Programming with control instructions using ARM processor (ARM926 kit)
- 7. Seven segment display interfacing using ARM processors. (ARM926 kit)

MICROCONTROLLER AND ARM PROCESSOR EBEE22ET5

Course Name: MICROPROCESSOR,

Prerequisite: Basic Electrical, Electronics and

Instrumentation Engineering

UNIT I 8085 PROCESSOR

Course

Code:

Functional block diagram - Signals - Memory interfacing - I/O ports and data transfer concepts - Timing Diagram -Interrupt structure Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions, subroutine and stack

UNIT II PERIPHERAL INTERFACING

Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter -- Interfacing with 8085 - A/D and D/A converter interfacing

UNIT III MICRO CONTROLLER 8051

Functional block diagram - Instruction format and addressing modes - Interrupt structure - Timer -I/O ports - Serial communication. Data Transfer, Manipulation, Control & I/O instructions

UNIT IV MICRO CONTROLLER PROGRAMMING & APPLICATION

Simple programming exercises: key board and display interface- interfacing an LCD- ADC and DAC interfacing -Sensors - Closed loop control of servo motor- interfacing a stepper motor

UNIT V INTRODUCTION TO ARM PROCESSORS

- 5. Simple Arithmetic Operations using ARM processor

- 8. LED display Interfacing using ARM processors. (ARM926 kit)



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TEXT BOOKS

- Gaonkar, R.S (2002) Microprocessor Architecture Programming and Application. New Delhi: Wiley Eastern Ltd
- Muhammad Ali Mazidi & Janice Gilli Mazidi, (2003) The 8051 Micro Controller and Embedded Systems. 5th Indian reprint, Pearson Education
- 3. Steve Furber, (2000) ARM System –On –Chip architecture. Addison Wesley

REFERENCE BOOKS

- 1. William Kleitz, (2006) Microprocessor and Micro Controller Fundamental of 8085 and 8051 Hardware and Software. Pearson Education
- 2. Daniel Tabak, Advanced Daniel Microprocessors. McGraw Hill Inc



Course Code: EBEE22L05	Cour	se Nam	e: POWF	ER ELEC	TRON	B		Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C	
	Prer	equisite	: Power E	lectronic	s				Lb	0	0/0	3/0	1
L: Lecture T: Tu	itorial	SLr: Sup	pervised L	earning P	P: Projec	t R: Res	earch C:	Credits	T/L/ETL	:			
Theory/Lab/Em	bedded	l Theory	and Lab										
OBJECTIVES													
To ob	otain a	n over vi	ew of diff	ferent type	es of po	wer sem	i-conduc	ctor devi	ces and th	eir s	witching		
chara	cterist	ics with	different t	riggering	method	ls.							
• To ur	ndersta	nd the o	peration, o	characteri	stics and	d perfor	mance pa	arametei	s of contr	olled	l Rectifie	rs and	
Inver	ters.												
• To ur	ndersta	nd the te	echniques	to control	the spe	ed of B	rushless	DC Mot	or and SR	Mo	tor		
• To ur	ndersta	nd the o	peration o	of AC Vol	tage Co	ntrollers	5						
To ur	ndersta	nd the a	pplication	s of Powe	er Electr	vices and	l Electric	c drives in	Pow	er Syste	m		
COURSEOUT	COM	ES(Cos)											
Students comple	eting th	is cours	e were ab	le to									
CO1	Recall the operation of power electronics devices and gain knowledge of the comparative study of												y of
	different devices based on their switching characteristics												
CO2	Summarize the operation of AC Voltage Controllers												
CO3	Relat	e the tec	hniques to	o control	the spee	ed of Bru	ishless D	C Moto	r and SR 1	Mote	or		
CO4	Infer	the oper	ation, cha	racteristic	es and p	erforma	nce para	meters c	of controll	ed R	ectifiers	and Inv	verters
CO5	Com	pare the	operation	of differe	ent conv	erters ar	nd incorp	orate in	designing	g the	HVDC		
Manning of Ca	Trans	5111551011	System										
	Durse Outcome with Program Outcome (POs)												
COs/POs	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO											011	PO12
COs/POs CO1	urse C PO1 3	PO2 2	with Pro PO3	gram Ou PO4 c	rtcome (PO5 3	(POs) PO6 3	PO7 3	PO8 2	PO9 3	PO	D10 P	D11 2	PO12 3
COs/POs CO1 CO2	PO1 3 3	PO2 PO2 2 2	with Pro PO3 3 2	egram Ou PO4 c 2	PO5 3 2	(POs) PO6 3 3	PO7 3 2	PO8 2 2	PO9 3 2	P (D10 P0 2 2 3 2	D11 2 2	PO12 3 3
COS/POS CO1 CO2 CO3	Urse C PO1 3 3 3	PO2 PO2 2 2 2	with Pro PO3 3 2 2	ogram Ou PO4 C 2 2	PO5 3 2 3 3 3	(POs) PO6 3 2	PO7 3 2 2	PO8 2 2 3	PO9 3 2 2	P(D10 P(2 2 3 2	D11 2 2 2 2	PO12 3 3 2
COS/POS CO1 CO2 CO3 CO4	urse C PO1 3 3 3 3	PO2 2 2 2 2 2 2 2 2 2	with Pro PO3 3 2 2 2 2 2	ogram Ou PO4 c 2 2 2 2 2 2 2 2 2 2 2	PO5 3 2 3 3 3	(POs) PO6 3 2 3 3	PO7 3 2 2 3	PO8 2 2 3 3	PO9 3 2 2 2 2		D10 P(2 2 3 2 2 2	D11 2 2 2 2 2 2 2	PO12 3 3 2 3
COS/POS CO1 CO2 CO3 CO4 CO5	PO1 3 3 3 3 3 3	PO2 2 2 2 2 3	with Pro PO3 3 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3	PO4 C 2 2 2 3	tcome (PO5 3 2 3 3 3	(POs) PO6 3 2 3 2 2	PO7 3 2 2 3 3 3	PO8 2 2 3 3 2	PO9 3 2 2 2 2 2 2		$\begin{array}{c c} \hline 10 & P(\\ \hline 2 & \hline 3 & \hline 2 $	D11 2 2 2 2 2 2 2 2 2 2	PO12 3 3 2 3 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOs	PO1 3 3 3 3 3 3	PO2 2 2 2 2 3	with Pro PO3 3 2 2 2 3 PSO1	PO4 c 2 2 2 3	PO5 3 2 3 3 3 3 3	(POs) PO6 3 2 3 2 PS	PO7 3 2 2 3 3 3 502	PO8 2 2 3 3 2	PO9 3 2 2 2 2 2		D10 P(2 2 3 2 2 2 2 2 2 2 2 2 PSO3 2	D11 2 2 2 2 2 2 2 2 2 2	PO12 3 3 2 3 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOsCO1	PO1 3 3 3 3 3 3 3	PO2 2 2 2 2 3	with Pro PO3 3 2 2 2 3 PSO1 3	PO4 c 2 2 2 3	PO5 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(POs) PO6 3 2 3 2 PS	PO7 3 2 2 3 3 3 502 2	PO8 2 2 3 3 2	PO9 3 2 2 2 2 2		D10 P0 2 2 3 2 2 2 2 2 2 2 PSO3 3	D11 2 2 2 2 2 2	PO12 3 3 2 3 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOsCO1CO2	PO1 3 3 3 3 3 3	PO2 2 2 2 2 3	with Pro PO3 3 2 2 3 PSO1 3 2	PO4 c 2 2 2 3	rtcome (PO5 3 2 3 3 3 3	(POs) PO6 3 2 2 PS	PO7 3 2 2 3 3 3 3 002 2 3	PO8 2 2 3 3 2	PO9 3 2 2 2 2		D10 P0 2 2 3 2 2 2 2 2 2 2 PSO3 3 2 2	D11 2 2 2 2 2 2	PO12 3 3 2 3 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOsCO1CO2CO3	PO1 3 3 3 3 3	PO2 2 2 2 3	with Pro PO3 3 2 2 3 PSO1 3 2 2	PO4 c 2 2 3	PO5 3 2 3 3 3	(POs) PO6 3 2 3 2 PS	PO7 3 2 2 3 3 3 3 3 3	PO8 2 2 3 3 2	PO9 3 2 2 2 2		$\begin{array}{c c} \hline 10 & P \\ \hline 2 & \hline 3 & \hline 2 & \hline 3 $	D11 2 2 2 2 2	PO12 3 3 2 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOsCO1CO2CO3CO4	PO1 3 3 3 3 3	PO2 2 2 2 2 3 I	With Pro PO3 3 2 2 3 2 3 PSO1 3 2 3 2 3 2 3 3 3 3	PO4 c 2 2 3	PO5 3 2 3 3 3 3 -	(POs) PO6 3 2 3 2 PS	PO7 3 2 2 3 3 3 2 2 3 2	PO8 2 2 3 3 2	PO9 3 2 2 2 2		$ \begin{array}{c cccccccccccccccccccccccccccccccccc$	D11 2 2 2 2	PO12 3 2 3 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOsCO1CO2CO3CO4CO5	PO1 3 3 3 3 3	PO2 2 2 2 2 3 F	with Pro PO3 3 2 2 3 PSO1 3 2 3 2 3 2 3 2 3 2 3 2 3 2	gram Ou PO4 c 2 2 2 3	PO5 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(POs) PO6 3 2 3 2 PS	PO7 3 2 3 3 3 3 3 3 2 3 2 3 2 3 2 3 2 3	PO8 2 2 3 3 2	PO9 3 2 2 2 2		$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	D11 2 2 2 2 2	PO12 3 2 3 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOsCO1CO2CO3CO4CO53/2/1 Indicates S	PO1 3 3 3 3 trengtl	PO2 2 2 2 2 3 F	with Pro PO3 3 2 2 3 PSO1 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 3 3 3 3 3 <	gram Ou PO4 c 2 2 2 3 -High, 2-	Atcome (PO5 3 2 3 3 3 3 4 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4	(POs) PO6 3 2 3 2 PS n, 1-Lov	PO7 3 2 2 3 3 3 3 2 3 3 2 3 3 2 3 3 2 3 3	PO8 2 2 3 3 2	PO9 3 2 2 2 2		D10 P0 2 2 3 2 2 2 PSO3 3 2 3 2 3 3 2 3 3 2 3 3 3	D11 2 2 2 2 2	PO12 3 3 2 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOsCO1CO2CO3CO4CO53/2/1 Indicates S	PO1 3 3 3 3 trengt	PO2 2 2 2 2 3 F	With Pro PO3 3 2 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 3	eram Ou PO4 c 2 2 2 2 3 -High, 2-	Medium	(POs) PO6 3 2 3 2 PS n, 1-Low	PO7 3 2 2 3 3 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	PO8 2 2 3 3 2	PO9 3 2 2 2 2		D10 P0 2 2 3 2 2 2 2 2 2 2 2 2 3 2 3 2 3 2 3 3 2 3		PO12 3 2 3 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOsCO1CO2CO3CO4CO53/2/1 Indicates S	PO1 3 3 3 3 trengtl	PO2 2 2 2 2 3 In of Corre	With Pro PO3 3 2 2 2 3 PSO1 3 2 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 3 2 3 <	eram Ou PO4 c 2 2 2 3 -High, 2-	Medium	(POs) PO6 3 3 2 PS n, 1-Low	PO7 3 2 2 3 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 2 3 3 2 2 3 3 2 2 3 3 2 2 3 3 3 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	PO8 2 2 3 3 2	PO9 3 2 2 2 2		D10 P0 2 2 3 2 2 2 2 2 3 2 3 2 3 2 3 2 3 2 3 3		PO12 3 2 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOsCO1CO2CO3CO4CO53/2/1 Indicates S	PO1 3 3 3 3 trengtl	PO2 2 2 2 2 3 Image: second state st	With Pro PO3 3 2 2 3 PSO1 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 3 2 3 2 3 3 3 3 3 3 3 <	egram Ou PO4 c 2 2 2 2 3 -High, 2-	Atcome (PO5 3 2 3 3 3 3 4 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4	(POs) PO6 3 3 2 PS n, 1-Low	PO7 3 2 2 3 3 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	PO8 2 2 3 3 2	PO9 3 2 2 2 2 		$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		PO12 3 3 2 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5COs/PSOsCO1CO2CO3CO4CO53/2/1 Indicates S	PO1 3 3 3 3	PO2 2 2 2 2 3 F	with Pro PO3 3 2 2 2 3 PSO1 3 2 3 PSO1 3 2 3 2 selection, 3	eram Ou PO4 c 2 2 2 2 3 -High, 2-	Medium	(POs) PO6 3 2 3 2 PS n, 1-Lov	PO7 3 2 2 3 3 3 3 2 3 3 2 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3	PO8 2 2 3 3 2	PO9 3 2 2 2		D10 P0 2 2 3 2 2 2 2 2 PSO3 3 2 3 3 2 3 3 2 3		PO12 3 2 3 3 3
Mapping of CoCOs/POsCO1CO2CO3CO4CO5CO5/PSOsCO1CO2CO3CO4CO53/2/1 Indicates S	PO1 3 3 3 3 4 trengtl	PO2 2 2 2 2 3 F	with Pro PO3 3 2 2 2 3 PSO1 3 2 2 3 2 clation, 3 South States of the second sec	eram Ou PO4 c 2 2 2 2 3 3 -High, 2-	Medium	(POs) PO6 3 3 2 PS n, 1-Low	PO7 3 2 2 3 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 2 3 3 3 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	PO8 2 2 3 3 2 2	PO9 3 2 2 2 2		D10 Pe 2 2 3 2 2 2 PSO3 3 2 3 3 2 3 2 3 3 2 3 3 2 3 3		PO12 3 2 3 3 3
Mapping of Co COs/POs CO1 CO2 CO3 CO4 CO5 CO7/PSOs CO1 CO2 CO3 CO4 CO2 CO3 CO4 CO2 CO3 CO4 CO5 3/2/1 Indicates S	PO1 3 3 3 3 1 trengtl	PO2 2 2 2 2 3 F	with Pro PO3 3 2 2 2 3 PSO1 3 2 2 3 2 clation, 3 Solution	PO4 C 2 2 2 3 -High, 2- Ilini S S S S S S C C C C C C C C C C C C C	Atcome (PO5 3 2 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4	(POs) PO6 3 3 2 PS PS n, 1-Low	PO7 3 2 2 3 3 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3	PO8 2 2 3 3 2 2	PO9 3 2 2 2 2 2 2 2 2		$\begin{array}{c c} \hline 10 & Pe \\ \hline 2 & \hline 3 & \hline 2 & \hline 2$		cal / Project
Mapping of Co COs/POs CO1 CO2 CO3 CO4 CO5 CO3 CO1 CO2 CO3 CO4 CO5 CO3 CO4 CO5 3/2/1 Indicates S	PO1 3 3 3 3	n of Corr	with Pro PO3 3 2 2 2 3 PSO1 3 2 2 3 2 celation, 3 South State of the second sec	PO4 C 2 2 2 3 -High, 2- High, 2- Image: Second Sec	Medium	(POs) PO6 3 2 3 2 PS n, 1-Lov	PO7 3 2 3 3 3 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3	PO8 2 2 3 3 2	erdisciplinary		D10 P0 2 2 3 2 2 2 PSO3 3 2 3 3 2 3 3 2 3 3 2 3 1		actical / Project
COS/POS CO1 CO2 CO3 CO4 CO5 CO5/PSOS CO1 CO2 CO3 CO4 CO5 3/2/1 Indicates S	PO1 3 3 3 3 trengtl	PO2 2 2 2 2 3 3 F	with Pro PO3 3 2 2 2 3 PSO1 3 2 2 3 2 clation, 3 South States of the second sec	PO4 C 2 2 2 3 -High, 2- Iripic and Social Ciences	Atcome (PO5 3 2 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4	(POs) PO6 3 3 2 3 2 PS	PO7 3 2 3 3 3 3 3 3 3 3 3 3 3 3 4 4 502 2 3 4 502 2 3 4 502 2 3 4 502 502 502 502 502 502 502 502 502 502 502 502 502 502 502 502 503 504 505 505 505 505 505 505 505 505	PO8 2 2 3 3 2	PO9 3 2 2 2 2		D10 Pe 2 2 3 2 2 2 PSO3 3 2 3 3 2 3 2 3 3 2 3 3 2 3 2		PD12 3 2 3 3 3 3



Course Code: EBEE22L05	Course Name: POWER ELECTRONICS LAB	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С
	Prerequisite: Power Electronics	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS

- 1. Characteristics of SCR, MOSFET, IGBT and TRIAC
- 2. Gate Pulse Generation using R, RC and UJT
- 3. Single phase half controlled and fully controlled bridge converter with R load and RL loads
- 4. Single phase AC voltage controller using TRIAC, DIAC with RANDRL loads
- 5. IGBT based Chopper
- 6. IGBT Based PWM Inverter
- 7. Single phase parallel inverter
- 8. Single phase Series inverter
- 9. Forced commutation circuits (Class A, Class B, Class C, Class D & Class E).
- 10. Single phase cyclo-converter with R and RL loads
- 11. Step down and step up MOSFET based choppers
- 12. Simulation of Single Phase and Three phase cycloconverters.



Course Code: EBEE22010	Course	Name: P	OWER S	YSTEN) F	Гу/ Lb/ ETL/IE	L	T/SLr	P/R	C			
	Prerequ	iisite: Ge	neration,	Transn	ributi	on	Ту	3	1/0	0/0	4		
L : Lecture T : T	Tutorial SI	Lr : Super	vised Lea	rning P:	Project	R : Rese	arch C	C: Credits	8				1
T/L/ETL:Theory	y/Lab/Em	bedded Tl	neory and	Lab	5								
OBJECTIVES													
• To a	attain basi	c knowled	lge and ap	oply iter	ative tech	nniques f	or pov	ver flow a	analysis				
• To r	nodel and	l carry out	short cire	cuit stud	lies on po	ower sys	tem						
• To r	nodel and	l analyze s	stability p	roblems	in powe	r system	l						
• To r	nodel the	power sys	stem unde	er steady	v state op	erating of	conditi	on					
• To l	earn pow	er system	models b	ased on	nodal ad	mittance	e and i	mpedance	e matrice	s for t	he ana	lysis o	of
larg	e –scale p	ower network	vorks.										
COURSEOUT	COMES(Cos)	na abla ta										
	To comm	course we	d analyza	the new	toody atot	a anarati	07						
	To compl To model	generato	i analyze	the pow	ines and	n anarys	is ili s n the r	leady stat	e operati	ond ze	ro sea	ience	
CO2	systems	To model generators, transformers, lines and cables in the positive, negative and zero sequence systems											
CO3	To analyz	ze symme	trical and	asymme	etrical fa	ults							
CO4	To establ	ish and so	lve equat	ions for	AC, DC	and opti	imal p	ower flow	v.				
CO5	To use po analysis o	ower syste of large –s	m models	s based o er netwo	on nodal orks.	admittar	nce an	d impeda	nce matr	ices fo	or the		
Mapping of Co	urse Out	come witl	n Progra	m Outco	ome (PO	s)							
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO'	7 PO8	PO9	PO1	0 PC)11	PO12
CO1	3	3	3	3	3	2	3	3	3	3	3		2
<u>CO2</u>	2	3	3	2	1	3	2	3	3	2	1		3
<u> </u>	3	3	2	3	2	2	3	3	2	3	2		2
C04	2	2	2	2	3	3	2	2	2	<u></u>	3		3
	3		<u> </u>	I	<u>_</u>		$\frac{3}{2}$	3	2	 			2
		<u>PS(</u>	Л			<u>P50</u>	02			P	303		
		<u> </u>					<u>,</u>				<u> </u>		
CO2		2)				2		
CO4		3				3	/				$\frac{3}{2}$		
CO5		2				2	2				3		
3/2/1 Indicates S	trength of	Correlati	on, 3–Hig	gh, 2-Me	edium, 1-	Low			1		-		
				_									
				ocial		S							
		ect and s a d S a d S a d											
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University with Graded Autonon

Course Code: EBEE22010	Course Name: POWER SYSTEM ANALYSIS	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
	Prerequisite: Generation Transmission and Distribution	Ту	3	1/0	0/0	4

UNIT I **POWER SYSTEM**

Need for system planning and operational studies – Power scenario in India – Power system – p.u. Single line components – Representation – diagram _ per unit quantities impedance p.u. diagram _ reactance diagram _ Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of - nominal transformer - Formation of bus admittance matrix of large power network.

POWER FLOW ANALYSIS UNIT II

Bus classification – Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method – Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method.

UNIT III SYMMETRICAL FAULT ANALYSIS

Assumptions in short circuit analysis using short circuit analysis – Symmetrical Thevenin's theorem – Bus Impedance matrix building algorithm (without mutual coupling) – Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level - Current limiting reactors.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS

Symmetrical components Sequence impedances Sequence networks Analysis of — _ unsymmetrical faults at generator terminals: LG, L and LG – unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.

UNIT V STABILITY ANALYSIS

Classification of power system stability - Rotor angle stability - Swing equation - Swing curve – Power-Angle equation – Equal area criterion – Critical clearing angle and time – Classical step-by-step solution of the swing equation – modified Euler method.

TEXT BOOKS

- 1. Hadi Saadat (2007) Power system analysis. 11th Reprint. Tata McGraw Hill Publishing Company, New Delhi,
- 2. P. Kundur (1994) Power System Stability and Control. Tata McGraw Hill Publishing Company, New Delhi,

REFERENCE BOOKS

- 1. Kothari, D.P. and Nagrath, I. J. (2003) Modern Power System Analysis. 3rd. Tata Mc Graw Hill Publishing Company Limited
- 2. M.A. Pai, (2003) Computer Techniques in power system Analysis. Tata McGraw Hill publishing company, New Delhi.
- 3. C.A. Gross, (2011) Power System Analysis," Wiley India

Total No. of Periods :60

56

12

12



12

12



Course Code: EBEE22012	Course VOLTA	Name: E AGE	LECTE	RIC TRA		Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С			
	Prerequ	iisite: Ge	neratio	n, Trans	mission a	and Dist	tributio	on,	Ту	3	0/0	0/0	3
	Power E	Lectroni	<u>cs</u>	· .			1.0	Q 1'4					
L: Lecture I: I	utorial SI	Lr : Super	vised Le	earning F	" Project	R : Rese	earch C	: Create	8				
ORIECTIVES	//Lau/EIII	bedded I	neory ai	iu Lau									
• To a	ttain basi	c knowle	dge on F	Power Ou	ality and	power S	System	operatio	n				
• To r	olot load d	luration c	urve and	l underst	and the ne	eed for 1	egulati	on					
• To i	mpart kno	owledge o	on Frequ	ency cor	trol and V	Voltage	Contro	1					
• To s	tudy the e	economic	operatio	on of pov	ver systen	n and U	nit com	mitment					
• To k	know the i	importan	ce of Sys	stem Mo	ity Meas	urement	Equip	oment					
COURSEOUT	COMES(Cos)											
Students comple	ting this c	course we	ere able t	10									
CO1	Acquire	knowled	ge on Po	ower Qua	peration								
CO2	Understa	anding of	load du										
CO3	Familiar	Familiar to Frequency control and Voltage Control											
CO4	Knowled	lge on ec	onomic	operation	n of powe	r systen	n and U	nit comn	nitment				
CO5	Understa Equipme	and the ir ent	nportanc	ce of Sys	tem Moni	toring a	nd Pow	ver Quali	ty Measu	reme	nt		
Mapping of Co	urse Outo	come wit	h Progr	am Outo	come (PC	s)	-						
COs/POs	PO1	PO2	PO3	PO4	<u>PO5</u>	PO6	PO7	PO8	PO9	<u>PO1</u>		011	PO12
	3	3	3	3	<u> </u>	2	3 2	3	3	<u> </u>	3		2
	2	3	$\frac{3}{2}$	2	2	3	2	3	3 2	2	2		$\frac{3}{2}$
CO4	2	2	2	$\frac{3}{2}$	3	3	$\frac{3}{2}$	2	2	$\frac{3}{2}$	3		3
CO5	3	3	2	1	2	2	3	3	2	1	2		2
COs /PSOs	-	PSO)1	_		PS	02	-			PSO3		
CO1		3				2					3		
CO2		1				3					2		
CO3		2				2	1				3		
CO4		3				3	6				2		
CO5		2				2	1				3		
3/2/1 Indicates S	trength of	Correlat	ion, 3–H	ligh, 2-M	ledium, 1	-Low			1				
egory	Basic Sciences Engineering Sciences Humanities and Social Sciences Program Electives Program Electives Interdisciplinary Interdisciplinary Practical / Project										Practical / Project		
Cat													

TEXT BOOKS

- 1. Allan Greenwood (1991) Electrical Transients in Power Systems. 2nd Ed. Wiley Inter Science, New York.
- 2. C.S. Indulkar, D.P. Kothari, K. Ramalingam (2010) Power System Transients A statistical approach. 2nd Ed. PHI Learning Private Limited, Second Edition.
- 3. M.S. Naidu and V. Kamaraju (2013) High Voltage Engineering. 5th Ed. McGraw Hill.

REFERENCE BOOKS

- 1. Y. Hase (2012) Handbook of Power System Engineering, Wiley India, 2012.
- 2. Akihiroametani, (2013) Power System Transient theory and applications. CRC press

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Course Code: EBEE22012	Course Name: ELECTRIC TRANSIENTS AND HIGH VOLTAGE	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С
	Prerequisite: Generation, Transmission and Distribution, Power Electronics	Ту	3	0/0	0/0	3

UNIT I SWITCHING TRANSIENTS

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. Illustration for multiple restriking transients - ferro resonance.

UNIT II LIGHTNING TRANSIENTS

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 III TRANSIENTS IN INTEGRATED POWER SYSTEM

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 Oualitative application of EMTP for transient computation.

UNIT IV **GENERATION OF HIGH VOLTAGES AND CURRENTS**

Generation of High Direct Current Voltages, Generation of High Alternating Voltages, Generation of Impulse Voltages, Generation of Impulse Currents, Tripping and Control of Impulse Generators.

MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS UNIT V

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixed dividers – Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters - Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

Total No. of Periods :45

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Course Code: EBEE22016	Course Nat CONSERV	me: EN ATION	ERGY N	UTILIZ		Ty ET	/ Lb/ L/IE	L	Г/SLr	P/R	C			
	Prerequisit	e: Gene	eration	, Transr	nission ai	ibutio	'n	Ту	3	0/0	0/0	3		
L: Lecture T: Tu	torial SLr: Su	upervise	ed Lear	ning P: F	Project R:	Researc	h C: C	redits T/	L/ETL:					
Theory /Lab/Em	bedded Theo	ry and I	Lab											
OBJECTIVES														
• To s	study the ener	gy cons	ervatio	n on bui	ldings									
• The	analyze the h	heating a	and coo	ling of t	ouildings									
• Und	lerstand the end	nergy ef	ficient	equipme	ent									
• Und	ierstands and	analyze	energy	auditing	g									
	COMES(Cor	witting												
Students comple	comes(cos	ng this course were able to												
bradenis compre	Recall the	Recall the fundamentals of Heating and Welding, Illumination, Electric Drives, HEVs and												
CO1	Energy Con	Energy Conservation principles												
C03	Comprehen	comprehend and impart knowledge on Heating, Welding, Illumination, Electric Drives,												
	HEVs and H	EVs and Energy Conservation principles												
CO3	Analyze the	e Heatii	ng and	Weldin	g, Illumir	ation, E	Electri	c Drives	, HEVs	and E	Energy			
	Conservatio	n princi	ples			1		1 ** * 1 1*	¥11					
CO4	HEVs and H	study va Energy (arious te Conserv	ation pr	es involved inciples	1 in Heat	ting ar	d Weldi	ng, Illum	inatio	n, Elec	tric D	rives,	
CO5	Scrutinize t	he arch	itecture	e and fe	atures of	various	Heat	ng and	Welding	, Illur	ninatio	on,		
Monning of Co	Electric Dri	ves, HE	Vs and	Energy	Conserva	tion prin	ciples							
COs/POs	PO1	PO2	PO3			PO6	PO7	PO8	POQ	PO1		11 1	PO12	
CO1	3	2	100	1	100	3	$\frac{101}{2}$	2	1	3	2		1	
CO2	3	2	2	2	2	3	3	3	3	3	2		2	
CO3	3	3	3	3	3	2	3	3	3	3	2		1	
CO4	3	3	3	3	3	3	2	3	3	3	2		1	
CO5	3	3	3	3	3	3	3	3	3	3	2		2	
COs/PSOs		PSO	1			PSC)2			P	SO3			
CO1		3				2					2			
CO2		3				3					3			
CO3		2				3					3			
<u>CO4</u>		3				$\frac{2}{2}$					3			
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Course Code: Course Name: ENERGY UTILIZATION AND Tv/Lb/ L T/SLr P/R **EBEE22016 CONSERVATION ETL/IE Prerequisite: Generation, Transmission and Distribution** 3 Ty 0/0

UNIT I **HEATING AND WELDING**

Advantages and methods of electric heating, resistance ovens, induction heating, dielectric heating, the arc furnace heating of building. Electric welding, resistance and arcwelding, control devices

UNIT II **ILLUMINATION**

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations - basic design of illumination schemes for residential, commercial, street lighting and sports ground -energy efficiency lamps.

UNIT III **ELECTRIC DRIVES**

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization

UNIT IV INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES

Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement and energy consumption

UNIT V **ENERGY CONSERVATION**

Principle of energy conservation - waste heat recovery - Heat pump – Economics of energy conservation, cogeneration, combined cycle plants, electrical energy conservation opportunities

TEXT BOOKS

- 1. Epenshaw Taylor, (2009) Utilization of Electric Energy. 12th Impression. Universities Press.
- 2. Mehrdad, Ehsani, Yimin Gao, Sabastien E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles. CRC Press.
- 3. Wadhwa, C.L. (2003) Generation, Distribution and Utilization of Electrical Energy. New Age International Pvt. Ltd.
- 4. Gupta, B.R. (2003) Generation of Electrical Energy. NewDelhi: Eurasia Publishing House(P)Ltd.

REFERENCE BOOKS

- 1. Soni Gupta, Bhatnager- Dhanapat Rai & sons A Course in Electrical Power.
- 2. Uppal, S. L. Electrical Power. Khanna Publications



Total No. of Periods:45



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Course Code: EBEE22L07	Course	Name: P	OWER	R SYSTEI	M LAB		Ty/I ETL	.b/ I /IE	T/S.I	r	P/R	С	
	Prerequ	isite: Po	wer Sys	stem Ana	lysis		Lb) () 0/0	0	3/0	1	
L : Lecture T : T	utorial SI	r : Super	vised L	earning P	P: Project I	R : Rese	arch C	C: Credits	5		L		
T/L/ETL:Theory	/Lab/Eml	bedded T	heory a	nd Lab									
OBJECTIVES													
• To I	know abou	ut the trai	nsmissio	on lines									
• To 1	understand	d Load Fl	ow Ana	alysis									
• To i	understand	about F	ault An	alysis	<u> </u>								
• 10 g • To f	gain know familiar al	oout Sim	Power a	electronic of Electric	c Circuits cal drives	using El	lectrica	al Softwa	re				
COURSEOUT	COMES(Cos)											
Students comple	ting this c	ourse we	re able	to									
C01	Recogni	ze the Po	wer sys	tem comp	onents								
CO2	Conduct	load flov	v analys	sis using v	various me								
CO3	Perform	the exper	riment o	on various	s types of	relays							
CO4	Simulate	e various	fault an	alysis in t	he power	system	netwo	rk					
CO5	Analyze	the powe	er netwo	ork on reg	ular basis								
Mapping of Co	urse Outo	come wit	h Progi	ram Outc	come (PO	s)		1		1			
COs/POs	PO1	PO2	PO	3 PO4	PO5	PO6	<u>P07</u>	7 PO8	PO9	PO10	PO	11 I	<u>2012</u>
<u>CO1</u>	3	2	2	2	3	3	2	3	2	3	2		2
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CO1		2				3	<u> </u>				3		
CO2		3				3	3			2	2		
CO3		3				2	2				3		
CO4		3				3	3			2	2		
CO5		3	0.1	<u></u>		3	,				3		
3/2/1 Indicates S	trength of	Correlati	on, 3–1	H1gh, 2-M	edium, 1-	Low			[
ategory	Basic Sciences	Basic Sciences Engineering Sciences Humanities and Social Program Core Program Electives Program Electives Interdisciplinary Skill Component Project											114040411 / 1140404
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Course Code: EBEE22L07	Course Name: POWER SYSTEM LAB	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: Power System Analysis	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS

- 1. Experimentation on Performance of Over Voltage Relay.
- 2. Experimentation on Performance of Under Voltage Relay.
- 3. Experimentation on Performance of Earth Fault Relay.
- 4. Experimentation on Performance of Differential Protection of transformer.
- 5. Experimentation on Dielectric Testing of transformer oil.
- 6. Experimentation on Performance of Over Current Relay using Electromagnetic and Digital Type.
- 7. Computation of Parameters and Modeling of Transmission Lines
- 8. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
- 9. Simulation on Load Flow Analysis-I: Solution of Load Flow and Related Problems Using Gauss-Seidel Method
- 10. Simulation on Load Flow Analysis-II: Solution of Load Flow and Related Problems Using Newton-Raphson and Fast-Decoupled Methods
- 11. Simulation on Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
- 12. Simulation on SLG fault in a power system network
- 13. Simulation on DLG fault in a power system network
- 14. Study the characteristics of MCB & HRC Fuse.



Course Code: EBEE22013	Course Nar POWER SY	ne: PO /STEM	WER [R QUALI'	OF Ty E1	7/ Lb/ TL/IE	L	T/SLr	P/R	C				
	Prerequisit	e: Powe	er Sys	stem Ana	lysis				Ту	3	0/0	0/0	3	
L : Lecture T : T	utorial SLr :	Supervi	sed L	earning P	: Project F	R : Rese	arch	C : Credit	s					
T/L/ETL: Theory	y/Lab/Embed	ded The	eory a	and Lab	U									
OBJECTIVES														
• To a	ittain basic kn	owledg	e on l	Power Qu	ality and p	power S	ysten	n operatio	n					
• To p	olot load dura	tion cur	ve an	d understa	and the ne	ed for re	egula	tion						
• To in	mpart knowle	edge on	Frequ	uency con	trol and V	oltage (Contr	ol						
• To s	tudy the econ	omic op	perati	ion of pow	ver system	and Un	it co	mmitment						
• To k	now the impo	ortance	of Sy	stem Mor	nitoring an	d Powe	r Qua	ality Meas	urement	Equip	oments			
COURSEOUT	COMES(Cos	DMES(Cos) of this course were able to												
Students comple	ting this cour	ng this course were able to												
CO1	Acquire kno	Acquire knowledge on Power Quality and power System operation												
CO2	Understandi	ng of lo	ad du	iration cui	rve and reg	gulation	need	ls						
CO3	Familiar to I	Frequen	су со	ontrol and	Voltage C	ontrol								
CO4	Knowledge	on econ	omic	operation	of power	system	and l	Unit comm	nitment					
CO5	Understand	the imp	ortan	ce of Syst	em Monit	oring an	nd Po	wer Quali	ty Meas	ureme	nt			
05	Equipment	-		-		-			-					
Mapping of Co	urse Outcom	e with]	Prog	ram Outo	come (POs	5)								
COs/POs	PO1	PO2	PC	D3 PO4	PO5	PO6	PO	07 PO8	PO9	PO	10 PC	011	PO12	
<u>CO1</u>	3	3	3	3	3	2	3	3	3	3	3		2	
CO2	2	3	3	2	1	3	2	3	3	2	1		3	
<u>CO3</u>	3	3	2	3	2	2	3	3	2	3	2		2	
CO4	2	2	2	2	3	3	2	2	2	2	3		3	
CO5	3	3	2	1	2	2	3	3	2		2		2	
COs /PSOs		PSO:	1			<u>PSC</u>	02			ł	<u>2803</u>			
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<u>CO2</u>		1				3					2			
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Course Name: POWER OUALITY AND CONTROL OF T/SLr P/R **Course Code:** Ty/Lb/ L С **EBEE22013 POWER SYSTEM ETL/IE Prerequisite: Power System Analysis** Ty 3 0/00/0 3

vith Graded Autonon (An ISO 21001 : 2018 Certified Institution) Periyar E.V.R. High Road, Maduravoyal. Chennai-95. Tamiln

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INTRODUCTION TO POWER QUALITY AND SYSTEM OPERATION UNIT I

Power Quality Terms- Overloading- Under Voltage- Over Voltage-Voltage Sag- Voltage Swell - Voltage imbalance-Voltage fluctuation-Power Frequency Variation - Harmonics - System load Characteristics-load curves and loadduration curve - load factor - diversity factor - Need for Voltage regulation and frequency regulation in power system -Basic P-F and Q-V control loops

UNIT II **REAL POWER - FREQUENCY CONTROL**

Fundamentals of AGC-Fundamentals of Speed Governing mechanisms and modeling-Speed-Load characteristics regulation of two Synchronous Machines in parallel- Control areas - LFC of single & Multi areas Static & Dynamic Analysis of uncontrolled and controlled cases -Tie line with frequency bias control -Steady state instabilities

UNIT III **REACTIVE POWER – VOLTAGE CONTROL**

Excitation system Modeling - Static & Dynamic Analysis - stability Compensation-Principles of transmission line compensation-Effect of Generator loading-static VAR System Modeling-System Level Voltage control

UNIT IV ECONOMIC DISPATCH AND UNIT COMMITMENT

Need for Economic Dispatch-Characteristics curve for Steam and hydroelectric Units - Co-ordination Equation with Loss and without losses-Base point and Participation Factor-Constraints and solutions in Unit Commitment -Priority List Methods-Forward Dynamic Programming approach

MONITORING & COMPUTER CONTROL OF POWER SYSTEMS UNIT V

Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration - SCADA and EMS functions-Control Strategies - Power quality Measurement Equipment - Harmonic Analyser - Flicker meter

TEXT BOOKS

- 1. Allen. J. Wood and Bruce F. Wollen berg, (2003) Power Generation, Operation and Control. John Wiley & Sons. Inc
- 2. Chakrabarti & Halder, (2004) Power System Analysis: Operation and Control. Ed. Prentice Hall of India
- 3. Kundur, P, (1994) Power System Stability and Control. USA: MC Graw Hill Publisher

REFERENCE BOOKS

- 1. Kothari, D.P. and Nagrath, I.J. (2003) Modern Power System Analysis. 3rd. Tata Mc Graw Hill Publishing **Company Limited**
- 2. Grigsby, L.L. (2001) The Electric Power Engineering, Hand Book. CRC Press & IEEE Press
- 3. Hadi Saadat, (2007) Power System Analysis.11th Reprint
- 4. N.V. Ramana, (2011) Power System Operation and Control, Pearson
- 5. C.A. Gross, (2011) Power System Analysis, Wiley India

Total No. of Periods :45

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Course Code:Course Name: SOLID STATE DRIVESTy/ Lb/LT/SLEBEE22011ETL/IEETL/IET/SL	r P/R	C									
Prerequisite: Power Electronics Ty 3 0/0	0/0) 3									
I · Lecture T · Tutorial SLr · Supervised Learning P: Project R · Research C · Credits											
T/L/ETL: Theory/Lab/Embedded Theory and Lab											
OBJECTIVES											
To impart knowledge on the AC and DC drives											
 Analyze the operation of converter/ chopper fed dc drive, both qualitatively and quantitatively Analyze and design the current and speed controllers for a closed loop solid state DC motor drive 											
 Analyze and design the current and speed controllers for a closed loop solid state DC motor drive Steady state operation and transient dynamics of a motor load system 											
To understand and suggest a converter for solid state drive											
To understand and suggest a converter for solid state drive COUDSE OUTCOMES(Cos)											
Students completing this course were able to											
CO1 Ability to select suitability drive for the given application											
CO2 Ability to analyze the operation of the converter/chopper fed dc drive.											
CO3 Ability to analyze the operation and performance of AC motor drives.											
CO4 Ability to study about the steady state operation and transient dynamics of a motor load	system.										
CO5 Ability to understand and suggest a converter for solid state drive											
Mapping of Course Outcome with Program Outcome (POs)											
COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10	2011	PO12									
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CO2 3 3 3											
CO3 3 3 3											
CO4 3 3 3											
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3/2/1 Indicates Strength of Correlation, 3–High, 2-Medium, 1-Low											
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Course Code:
EBEE22011Course Name: SOLID STATE DRIVESTy/ Lb/
ETL/IELT/SLrP/RPrerequisite: Power ElectronicsTy30/00/0

UNIT I DRIVE CHARACTERISTICS

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

UNIT II CONVETER/CHOPPER FED DC MOTOR DRIVE

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 operation of converter / chopper fed drive-Applications.

UNIT III INDUCTION MOTOR DRIVES

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

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

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

Total No. of Periods:45

TEXT BOOKS

- 1. G.K. Dubey (2001) Fundamentals of electric drives. 2nd ed. Narosa publishing house
- 2. Bimal K. Bose (2002) Modern Power Electronics and AC Drives, Pearson Education.
- 3. R. Krishnan (2001) Electric Motor & Drives: Modeling, Analysis and Control, Pearson.

REFERENCE BOOKS

- 1. Vedam Subramanyam (2016) Electric Drives Concepts and Applications 2nd Ed. McGraw Hill.
- 2. John Hindmarsh and Alasdain Renfrew (2012) Electrical Machines and Drives System, Elsevier
- 3. Theodore Wildi (2015) Electrical Machines Drives and power systems, 6th edition, Pearson Education.



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Course Code: EBEE22014	Course Name: FACTS AND HVDC TRANSMISSION								y/ Lb/ TL/IE	L	T/SLr	P/R	C
	Prerequisite: Power Quality and Control of Power System							em	Ту	3	0/0	0/0	3
L: Lecture T: Tu	Γ: Tutorial SLr: Supervised Learning P: Project R: Research C: Credits T/L/ETL:										<u> </u>		
Theory/Lab/Em	bedded [Theory a	ind Lab	0	5								
OBJECTIVES													
• To a	attain kn	owledge	e on HVD	С									
• To 1	• To model the HVDC system												
• To]	o know about FACTS Controllers												
• To 1	To model the Power flow system												
• To 1	To model the HVDC system, FACTS controllers in a cost-effective manner												
COURSEOUT	COMES	S(Cos)	1.1										
Students comple	ting this	course	were able	to									
CO1	Recog	nize the	Power elec	ctronics co	mponents				~				
CO2	Classif	y the Po	ower electr	onic comp	onents, HV	/DC sys	stem a	and FACT	'S device	es			
CO3	Summa	arize im	portance of	f HVDC, F	FACTS for	a powe	er flov	v modelin	g with n	nodern	tool		
CO4	Analyz	ze the H	VDC cable	es, FACTS	controller	s and de	evices	for a sust	ainable	enviro	nment		
CO5	Model	the HV	DC system	n, FACTS o	controllers	in a cos	st-effe	ective man	ner				
Mapping of Co	urse Ou	tcome v	vith Prog	ram Outco	me (POs)			1	T	-			
COs/POs	PO1	PO	2 PO3	PO4	PO5	PO6	<u>PO</u>	07 PO8	PO9	POI		011	PO12
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CO2			3			$\frac{3}{2}$		3					
CO3			2				2						
CO4			3		2						3		
CO5			3			3					3		
3/2/1 Indicates S	trength o	of Corre	lation, 3–H	ligh, 2-Me	dium, 1-L	ow			-			-	
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T/SLr P/R **Course Code: Course Name: FACTS AND HVDC TRANSMISSION** Tv/ Lb/ L **EBEE22014** ETL/IE

Prerequisite: Power Quality and Control of Power System

UNIT I INTRODUCTION TO HVDC

Introduction of DC Power transmission technology - Classification of HVDC links- Components of HVDC transmission system-Comparison of AC and DC-Planning and Modern trends in DC transmission.

UNIT II HVDC CABLES AND MODELING OF HVDC SYSTEMS

Introduction of DC cables – Basic physical phenomenon arising in DC insulation – Practical dielectrics – Dielectric stress consideration - Economics of DC cables compared with AC cables- Introduction to converter model of HVDC

UNIT III INTRODUCTION TO FACTS

The concept of flexible AC transmission - reactive power control in Electrical power transmission lines -uncompensated transmission line - series and shunt compensation. Overview of FACTS devices - Static VAR Compensator (SVC) -Thyristors Switched Series capacitor (TCSC) - Unified Power Flow controller (UPFC) -Integrated Power Flow Controller (IPFC).

UNIT IV **EMERGING FACTS CONTROLLERS**

Static Synchronous Compensator (STATCOM) - operating principle - V-I characteristics - Unified Power Flow Controller (UPFC) –Principle of operation -modes of operation– applications

UNIT V POWER FLOW MODELING

Power flow modeling of SVC, TCSC, STATCOM and UPFC.

TEXT BOOKS

- 1. Mohan Mathur, R. Rajiv K. Varma, Thyristor–Based Facts Controllers for Electrical Transmission Systems. IEEE press and John Wiley & Sons, Inc.
- 2. ACHAetal, E. Power Electronic Control in Electrical Systems. Newness Power Engineering Series.
- 3. Padiyar, K.R. (1990) HVDC power transmission system. 1st Ed. NewDelhi: Wiley Eastern Limited.
- 4. Edward Wilson Kimbark, (1971) Direct Current Transmission. Vol.I. Wiley interscience. NewYork: London: Sydney:

REFERENCE BOOKS

- 1. John, A.T. (1999) Flexible AC Transmission System. Institution of Electrical and Electronic Engineers (IEEE).
- 2. Narain G. Hingorani, Laszio, Gyugyl, (2001) Understanding FACTS Concepts and Technology of Flexible AC Transmission System. Delhi: Standard Publishers.



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Total No. of Periods: 45

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(An ISO 21001 : 2018 Certified Institution) Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India.

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Course Code: EBEE22015	Course Name: SMARTGRID AND ELECTRIC VEHICLE TECHNOLOGY								y/ Lb/ TL/IE	L	T/SLr	P/R	С
	Prerequisite: Generation, Transmission and Distribution,							on,	Ту	3	0/0	0/0	3
	Power S	System A	<u> </u>										
L: Lecture 1 : 1 T/L/ETL: Theor	T/I /FTI · Theory/I ab/Embedded Theory and I ab												
OBJECTIVES	y/Lad/Em	bedded I	neory a	nd Lad									
	ntroduco l	asia con	ponts of	emort ari	d								
• 101 • To i	 To impart knowledge on smart grid designing 												
• To i	To introduce basic concepts of electric vehicle technology												
• To l	To learn the principle and operation of Electric Vehicles												
• Kno	wledge at	out E-m	bility b	usiness.		••••••							
COURSEOUT	COMES(Cos)	<u> </u>										
Students comple	ting this c	ourse we	re able t	0									
CO1	Understar	nd issues,	opportu	inities & c	challenge	s in Sm	art grid						
CO2	Designing	g and dev	elop skil	lls require	ed for sm	art grid j	plannin	ıg					
CO3	To unders	stand the	basic co	ncepts of	electric v	vehicle t	echnolo	ogy					
CO4	To unders	stand the	principle	e and oper	ration of	Electric	Vehicl	es					
CO5	Acquire k	nowledge	e on E-I	ndian elec	ctricity b	usiness o	on India	an roadn	nap persp	pective	e		
Mapping of Co	urse Outo	come wit	n Progr	am Outco	ome (PO	s)							
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	lo PC) 11	PO12
CO1	3	3	2	2	3	3	2	3	2	2	3		3
CO2	2	3	3	3	2	3	3	2	3	3	2		3
<u>CO3</u>	3	2	3	3	3	2	3	2	3	3	3		2
<u>CO4</u>	2	3	2	3	2	3	$\frac{2}{2}$	3	2	3	2		3
	3	<u>3</u>	3	3	3	3 DC	3	Z	3	3	3		3
COs /PSOs		<u>PS0</u>	<u>PS02</u>					ł	<u>2 2</u>				
		2				, }				3			
CO3		$\frac{2}{3}$ $\frac{3}{2}$ $\frac{3}{3}$					3						
CO4		2				3	;				2		
CO5		3				3	;				3		
3/2/1 Indicates S	trength of	Correlati	on, 3–H	ligh, 2-Me	edium, 1-	Low							
	iences v es t t									aot aot			
Aroge	asic Sciences asic Sciences ngineering Scie umanities and S ciences rogram Core rogram Elective pen Electives pen Electives terdisciplinary							Skill Compone		Tacucal / I tuj			
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UNIT I INTRODUCTION TO SMART GRID

Power System Analysis

TECHNOLOGY

Introduction - Evolution of Electric Grid, Smart Grid Concept - Definitions and Need for Smart Grid - Functions -Opportunities – Benefits and challenges, Difference between conventional & Smart Grid, Technology Drivers.

DESIGNING SMARTGRID UNIT II

Barriers and solution to smart grid development- General Level Automation- Power System Automation at Transmission Level-Distribution Level Automation- End user level-Applications for adaptive control and optimization.

UNIT III VEHICLES

Course Code:

EBEE22015

Vehicle resistance, Types: Rolling resistance, grading resistance, Aerodynamic drag vehicle performance, calculating the acceleration force, Maximum speed, finding the total tractive effort, torque required on the drive wheel. Transmission: Differential, clutch & gear box, Braking performance.

UNIT IV HYBRID VEHICLES

Types of Evs, Hybrid electric drive- train, Tractive effort in normal driving – Energy consumption concept of hybrid electric drive trains, Architecture of Electric Drive Trains, Series and parallel hybrid electric drive trains

UNIT V **BATTERY MANAGEMENT SYSTEM**

Need of BMS-Rule based control and optimization-based control-Software based high level supervisory control-Mode power - Behavior of motor - Advance Features.

Total No. of Periods: 45

TEXT BOOKS

- 1. Gilbert N. Sorebo & Michael C. Echols, Smart Grid Security-An end-to-end view of security in the new Electrical grid. CRC Press.
- 2. James Momoh, Smart Grid-Fundamentals of Design and Analysis. CRC Press.
- 3. Janaka B. Ekanayake, Kithsiri Liyanage, JianzhongWu, Akihiko Yokoyama, NickJenkins Smart Grid Technology & Application. In Wiley.
- 4. James Larminie, J. Lowry, "Electric Vehicle Technology Explained", John Wiley & Sons Ltd. 2003.
- 5. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
- 6. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.

REFERENCE BOOKS

- 1. David Gao (2015) Energy Storage for Sustainable Microgrid, 1stEd, Elsevier
- 2. Emadi, A. (Ed.), Miller, J., Ehsani, M., "Vehicular Electric Power Systems" Boca Raton, CRC Press, 2003.
- 3. Tarig Muneer and Irene Illescas García, "The automobile, In Electric Vehicles: Prospects and Challenges", Elsevier, 2017.

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Comment to saves	University with Graded Autonomy Status	
	(An ISO 21001 : 2018 Certified Institution)	

Perivar E.V.R. High Road, Maduravoval, Chennai-95, Tamilnadu, India

Course Name: SMARTGRID AND ELECTRIC VEHICLE

Prerequisite: Generation, Transmission and Distribution,



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Course Code: EBEE22E01	Course Name: WIND ENERGY CONVERSION TECHNIQUES						Ty/ ETI	Lb/ L/IE	L	T/SLr	P/R	С	
	Prerec	uisite: Energy Utilization and Conservation						T	y	3	0/0	0/0	3
L: Lecture T: Tu	itorial S	Lr: Supe	rvised I	earning	P: Proje	ect R:	Research	C: Credi	ts	1	I	11	
T/L/ETL:Theory	y/Lab/Er	nbedded	l Theory	and La	b								
OBJECTIVES													
• T	o know	the basi	cs of W	ind Enei	gy Con	versio	n System						
• T	To solve	the Ene	rgy crisi	s.									
• T	• To know the Power Electronic Devices and its characteristics.												
• To understand different converters													
• To design wind Energy conversion system such as sub systems and its components													
COURSE OUT	COME	S(Cos)											
Students comple	ting this	course	were ab	le to	1 5	~							
<u>CO1</u>	Recoll	ection of	t basics	$\frac{100}{5}$	a Energy	y Con	version Sy	stem					
<u>CO2</u>	Recogn	hize and	solve th	e Energ	y crisis		D '	1.4 1	. ·				
<u>C03</u>	Conve	y the cha	aracteris	tics Pow	/er Elect	for dia	Devices a	ind its ch	aracteris	stics			
<u>C04</u>	Analyz	e and d	esign the	e charact	teristics	Ior di	Terent co	nverters					
CO5 Manning of Co	Explor		with Dr	nd Energ	gy conve	ersion	system st	ich as su	b system	is and	us compo	onents	
Mapping of Co	urse Ou	licomes	with Fr	ogram	Juicom	les (P	J S)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO	6 PO7	PO8	PO9	PO1	0 PO1	.1 P	012
CO1	3	2	3	2	3	3	3	3	3	3	3		3
CO2	3	2	3	3	3	3	3	3	3	3	3		3
CO3	3	2	3	2	3	3	3	3	3	3	3		3
CO4	3	2	3	2	2	3	1	3	3	3	3		3
CO5	3	2	3	3	3	3	3	3	3	2	3		3
COs /PSOs		PS	01			F	SO2				PSO3		
CO1			3				3				3		
CO2			3				3				3		
<u>CO3</u>			3				3				3		
<u>CO4</u>			2				3				1		
CO5	1		<u> </u>	TT: 1 (1 1	3				3		
3/2/1 Indicates S	trength (of Corre	lation, 3	–High, 2		m, 1-1	LOW						
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Course Code: EBEE22E01	Course Name: WIND ENERGY CONVERSION TECHNIQUES	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С
	Prerequisite: Energy Utilization and Conservation	Ту	3	0/0	0/0	3

UNIT I MODELLING OF THE DOUBLY FED INDUCTION GENERATOR(DFIG)

Mechanical and three phase electrical models. "Quadrature-Phase Slip-Ring (QPSR) model. Expression of the DFIG and QPSR model in a single generic reference frame. Particularization to the stator flux/voltage –oriented reference frame for vector control (VC).

UNIT II MODELLING OF PERMANENT MAGNET SYNCHRONOUS GENERATOR (PMSG)

Rotor flux-oriented model of the PMSG: Analogy with the stator flux/voltage-oriented DFIG model. Arrangement of the global electromechanical model in state equations for simulation.

UNIT III WIND TURBINE SUB SYSTEMS & COMPONENTS

Design of WECS components-Stall, pitch & yaw control mechanisms-Brake control mechanisms-Theoretical simulation of wind turbine characteristics; Test methods

UNIT IV APPLICATION OF WIND ENERGY

Wind pumps - Performance analysis, design concept and testing - Principle of Wind Energy Generators - Standalone, grid connected and hybrid applications of WECS- Economics of wind energy utilization-Wind energy in India

UNIT V OVERVIEW OF SMALL HYDRO POWER SYSTEM

Overview of micro, mini and small hydro systems- Hydrology- Elements of pumps and turbine - Selection and design criteria of pumps and turbines-Site selection and civil works-Speed and voltage regulation-Investment issues load management and tariff collection; Distribution and marketing issues: case studies; Potential of small hydro power in India.

Total No. of Periods: 45

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TEXT BOOKS

- 1. Manwell, J.F. Mcgowan, J.G. Rogers, A. L (2002) Wind Energy Explained–Theory, Design & Application. John Wiley &Sons
- 2. GrayL.Johnson (1985) Wind Energy Systems. Prentice Hall Inc
- 3. Bose, B.K. (2001) Modern Power Electronics & AC Drives. Prentice Hall

REFERENCE BOOKS

- 1. Vaughn Nelson, (2009) Wind Energy– Renewable Energy & the Environment. CRC Press
- S.T. Rama, E. Sheeba Percis, A. Nalini, S. Bhuvaneswari (2017), Handbook on Standalone Renewable Energy Systems, 1st Edn, Research India Publication ISBN No 978-93-87374-12-6


Course Code: EBEE22E02	Cours ENGI	Course Name: IOT APPLIED TO ELECTRICAL ENGINEERING									Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
	Prerec	uisite: (Com	municat	ion Syst	tems	s and I	ОТ			Ту	3	0/0	0/0	3
L.·Lecture T.·T	utorial SI	r · Supe	rvis	ed Learni	nσ P· Pr	oiec	rt R · R	esear	rch	$C \cdot Cre$	dits				
T/L/ETL:Theory	/Lab/Em	bedded 7	Theo	ry and La	ab	ojee		cocu	U UII	0.010	ans				
OBJECTIVES				2											
• To s	study IoT	in Elect	ric E	ngineerii	ng										
• To s	study Tele	ematics l	Devi	ces	0										
• To S	Study IoT	Sensors	3												
• To S	Study Sm	art grid a	and I	Microgrid	l										
• To S	Study Sm	art Space	e Se	curity Sys	stem										
COURSE OUT	COMES	(Cos)													
Students comple	ting this c	course w	ere a	able to											
CO1	Recog	nize the	IOT	devices		IOT	C		1			• .			
<u>CO2</u>	Classif	y the me	etho	is to inco	rporate	IOT	for a su	ustan	nat	ole and s	smart soc	eiety			
<u>CO3</u>	Summ	arize the	Tel	ematics, S	Smart en	nerg	y and v	ariou	1S S	ecurity	measure	8			
<u> </u>	Design	an inno	vatr	ve smart	system t	ase	$\frac{d \text{ on IO}}{1}$	T in	a c	ost-effe	ective ma	nner			
CO5	Interpr	et the in	dust	rial IOT a	ind impr	ove	the sec	urity	/ m	easures					
Mapping of Col	arse Outo	come wi	th P	rogram	7	DOP	DOD	DOI		11	0012				
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C04	3	3	1		3		2	2		2	2	3	2	,	2
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CO1		15	2				150	J <u>4</u>				1	303		
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CO5		-	- 3				<u>-</u> 3						2		
3/2/1 Indicates St	rength of	Correla	tion,	3–High,	2-Medi	um,	1-Low								
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Course Code: EBEE22E02	Course Name: IOT APPLIED TO ELECTRICAL ENGINEERING	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
	Prerequisite: Communication Systems and IOT	Ту	3	0/0	0/0	3

UNIT I **INTRODUCTION TO IOT**

Introduction-Need of IOT in Electrical Engineering-Challenges in Implementation of IOT-Trends in Electrical Engineering - Configuration and Scalability-Efficiency-Quality of Service

UNIT II **TELEMATICS**

Smart Devices-Smart Apps-Wearable Technology-Vehicle Telemetry-Smart Homes and Building Automation-Vehicle Charging Station

UNIT III SMART ENERGY

Generation-Transmission-Distribution and Metering-Storage-Smart Monitoring and Diagnostics System at Major Power Plants-Micro grid and Virtual Power

UNIT IV **INDUSTRIAL IOT**

Real-Time Monitoring and Control of Processes-Deploying Smart Machine-Smart Sensor-Smart Controllers -SCADA- Proprietary Communication

UNIT V SECURITY MEASURES

Securing Smart Spaces and Smart Grid-Smart Grid-Service that need to be Secure- Security Requirement-Security Smart Spaces-Smart Tracking Firewall - Crypto graphic Key in the IoT

Total No. of Periods: 45

TEXT BOOKS

1. George Mastorakis, (2016), Internet of Things (IoT) in 5G Mobile Technologies, 1st ed. Edition, Publisher **SPRINGER**

REFERENCE BOOKS

1. Enterprise IoT: Strategies and Best Practices for Connected Products and Services, DirkSlama, FrankPuhlmann, JimMorrish, RishiM Bhatnagar, Publisher O'REILLY



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Course Code: EBEE22E03	Course Name: MECHATRONICSTy/ Lb/ ETL/IELT/SLrP/RC													
	Prereg	uisite: (Control Sys	stems					Ту	3	0/0	0/0	3	
I · Lecture T · 7	- Futorial	SI r · Si	nervised I	earning P.	Project R	·Resea	urch C	· Credits	•					
T/L/ETL:Theor	v/Lab/E	Embedde	d Theory a	nd Lab	i ioject iv	. Resea		. creans						
OBJECTIVES														
• To	o unders	stand the	concepts of	of sensors a	nd transd	lucers								
• To	o learn i	nterface	programm	ing										
• To	o apply	control s	system prol	olems										
• To	o learn t	he desig	n of sensor	s, actuators	s with the	use of 1	noder	n tool						
• To	o unders	stand the	recent trei	nds and adv	ancemen	t in Mee	chatror	nics						
COURSE OUT	COMI	LS(Cos)		4.5										
Students comple	Pocogr	is course	were able	lo	oto									
	Summe	rize the	design con	, actuators	$\frac{1}{10000000000000000000000000000000000$	ctuators								
C02	Internre	et the dee	sion analys	is in Mech	atronics	ciuaiois								
CO4	Design	the sens	ors. actuat	ors with the	e use of m	odern to	ool							
C05	Paraph	rase the	recent trend	is and adva	incement	in Mech	natroni	cs						
Mapping of Co	urse Outcome with Program Outcome (POs)													
COs/POs	PO1	PO1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12												
CO1	3	3	3	3	3	3	3	3	3	3	3	5	3	
CO2	3	3	3	3	2	2	2	3	2	3	2		2	
CO3	3	3	3	3	3	3	1	3	3	3	3	;	3	
CO4	1	3	3	3	2	2	3	3	2	3	2		2	
CO5	3	3	3	2	3	3	2	3	2	2	3		3	
COs /PSOs			PSO1			PS	02]	PSO3			
<u>CO1</u>			3				3				3			
CO2			3			2	2				2			
<u>CO3</u>			3				3				3			
<u>CO4</u>			3			4	2				2			
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5/2/1 mulcales	es Strength of Correlation, 3–Hign, 2-Medium, 1-Low													
ıtegory		Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	▲Prooram Electives		Open Electives	Interdisciplinary		Skill Component	- - -	Practical / Froject	
ũ														

Mechatronics-definition and key issues-evolution-elements-mechatronics approach to modern Engineering design.

UNIT II SENSORS AND TRANSDUCERS

Types-displacement, position, proximity and velocity sensors-signal processing-data display.

UNIT III **ACTUATION SYSTEMS**

Mechanical types-applications-electrical types-applications-pneumatic and hydraulic systems-applications -selection of actuators

UNIT IV **CONTROL SYSTEMS**

Types of controllers-programmable logic controllers-applications-ladder diagrams-microprocessor applications in mechatronics-programming interfacing-computer applications

UNIT V **RECENT ADVANCES**

Manufacturing mechatronics – automobile mechatronics – medical mechatronics – office automation – case studies.

Total No. of Periods:45

TEXT BOOKS

- 1. Bulton, N. (1995) Mechatronics: Electronic Control system for Mechanical and Electrical Engineering, Long man.
- 2. Dradly, D.A. Dawson, D. Burd, N. C. and Loader, A.J. (1993) Mechatronics: Electronics in products and processes, Chapman & Hall.

REFERENCE BOOKS

- 1. HMT Mechatronics. NewDelhi: Tata McGraw-Hill.
- 2. GalipUlsoyA., and Devices, W.R. (1989) Microcomputer Applications in Manufacturing. USA: John wiley.
- 3. James Harter, (1995) Electromechanics: Principles, concepts and devices. New Jersey: Prentice Hall.



Course Code: EBEE22E03	Course Name: MECHATRONICS	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С
	Prerequisite: Control Systems	Ту	3	0/0	0/0	3

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Course Code: EBEE22E04	Course	Name: 1	FIBER C	PTICS (COMM	UNICA	ATION]	Fy/ Lb/ ETL/IE	L	T/SLr	P/R	C
	Prereq	uisite: C	ommuni	cation Sys	stems a	nd IO	Г		Ту	3	0/0	0/0	3
L : Lecture T : T	Futorial	SLr : Su	pervised]	Learning l	P: Proje	ct R : F	Research C	: Credits				1	
T/L/ETL:Theor	y/Lab/E	mbedded	l Theory	and Lab									
OBJECTIVES													
• To	o learn t	he basic	elements	of optical	fiber ti	ansmis	sion link, f	iber mod	es config	uratio	ns and st	ructu	es
• To	o learn f	iber optic	es receive	rs such as	s PIN A	PD dio	des						
• To	o learn t	he fiber o	optical ne	twork cor	nponen	ts, varie	ety of netw	orking as	pects				
• To	o learn t	he factor	s that affe	ect the opt	tical fib	er com	nunicatior	systems					
• To	o design	optical r	networks	and under	stand n	on-line	ar effects i	n optical	fibers				
COURSE OUT	COMI	ES(Cos)											
Students comple	eting the	is course	were able	e to	. 1.0	1	·						
<u>C01</u>	Explair	the prince	ciples of	various op	otical fi	ber com	municatio	n systems					
<u>CO2</u>	Unders	tand the p	properties	of the op	tical fit	ber and	optical con	nponents					
<u>C03</u>	Analyz	e the peri	formance	of optical	comm	unicatio	on systems	ingtion of	-				
C04	Unders	tands the	factors tr	at arrect	the opti	cal fibe	r commun	1cation sy	stems				
CO5 Monning of Co	Design	oplical n	etworks a	ind unders	stand no	$\frac{\text{DO}}{\text{DO}}$	ir effects fi	i optical i	ibers				
CO ₂ /PO ₂	Durse U	O1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12											
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C02	3	3	3	3	3	3	1	3	3	3			3
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C05	3	3	3	2	3	3	2	3	2	2	3		3
COs /PSOs	-	P	<u>501</u>	_			PSO2				PSO3		
C01			3				3				3		
CO2			3				2				2		
CO3			3				3				3		
CO4			3				2				2		
CO5			2				3				3		
3/2/1 Indicates	Strengt	h of Corr	elation, 3	–High, 2-	Mediur	n, 1-Lo	W		-				
	ces Sciences and Social and Social and Social nary nary nary												
şory	Basic Scienc Engineering Humanities a Sciences Program Co						rogram Ele	Jpen Electiv	nterdisciplir		skill Compo		Tacucai / ri
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General system- transmission link-advantage of optical fiber communication-basic structure of optical fiber waveguideray theory transmission-optical fiber modes and transmission-optical fiber modes and configuration-step index and graded index fiber-single mode fiber-fiber materials-photonic crystal, fiber optic cables specialty fibers.

OPTICAL TRANSMISSION AND RECEIVER UNIT II

Introduction-Attenuation-absorption-scattering losses-bending loss-dispersion-intra model dispersion-inter model dispersion -Optical receiver operation-receiver sensitivity-quantum limit-eye diagrams-coherent detection-burst mode receiver-Analog receivers.

UNIT III ANALOG LINKS

Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links, microwave photonics.

UNIT IV DIGITAL LINKS

Digital links – Introduction, point-to-point links, System considerations, link power budget, resistive budget, short wave length band, transmission distance for single mode fibers, Power penalties, nodal noise and chirping.

UNIT V DIGITAL TRANSMISSION SYSTEMS

Point to point links-system considerations-link power budget-modulation formats for analog communication system-Introduction to WDM concept -Introduction to advanced multiplexing strategies.

TEXT BOOKS

- 1. J. Keiser, Fibre Optic communication, McGraw-Hill, 5th Ed. 2013 (Indian Edition).
- 2. J. Gowar, Optical communication systems, Prentice Hall India, 1987.
- 3. S.E. Miller and A.G. Chynoweth, eds., Optical fibres telecommunications, Academic Press, 1979.
- 4. G. Agrawal, Nonlinear fibre optics, Academic Press, 2nd Ed. 1994.

REFERENCE BOOKS

- 1. T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.
- 2. G. Agrawal, Fiber optic Communication Systems, John Wiley and sons, New York, 1997
- 3. F.C. Allard, Fiber Optics Handbook for engineers and scientists, McGraw Hill, New York, 1990.



Course Code: EBEE22E04	Course Name: FIBER OPTICS COMMUNICATION	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С
	Prerequisite: Communication Systems and IOT	Ту	3	0/0	0/0	3

Total No. of Periods:45

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Course Code: EBEE22E05	Cour TEC	se Name: HNIQUE	SOLAR H S	ENERGY	CONV		Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C			
	Prere	quisite: H	Energy Uti	lization a	and Co	nservatio	n		Ту	3	0/0	0/0	3	
L : Lecture T : '	Tutoria	al SLr : Su	pervised I	.earning l	P: Proje	ct R : Re	search (C : Credit	s				4	
T/L/ETL:Theor	y/Lab	Embedde	d Theory a	ind Lab										
OBJECTIVES	5													
• To	o study	about So	lar Radiati	on and th	e collec	tor types								
• 10	o impa	rt knowle	dge on the	Applicat	1 on of S	olar ther	nal Tec	hnology						
• 10	o unde	rstand the	fundamen	tals of Sc	lar Phot	to voltaic	cells							
	o desig	n the Sola	solar pass	ive Archi	tecture	iner.								
COURSE OUT		IES(Cos)	solai pass											
Students compl	eting t	his course	were able	to										
	Recol	lect the ba	sics of sol	ar radiati	on, prin	ciples of	collecto	ors, applie	cations of	solar e	energy,	desig	n	
	the P	V cells and	l its archite	ecture		•								
CO2	Realiz archit	ze the applecture	lications of	f collecto	rs, appli	cations o	of solar	energy, d	esign the l	PV cel	ls and	its		
CO3	Analy archit	ze and de	sign the co	ollectors,	applicat	ions of s	olar ene	rgy, desig	gn the PV	cells a	and its			
CO4	Examine the PV system design and applications of solar energy, design the PV cells and its architecture Articulate the usage of solar passive architecture and its applications collectors, applications of solar													
CO5	Articulate the usage of solar passive architecture and its applications collectors, applications of solar energy, design the PV cells and its architecture													
Mapping of Co	ourse	Outcome	with Prog	ram Out	come (l	POs)		1						
COs/POs	PO1	PO2	PO3	<u>PO4</u>	PO5	PO6	PO	7 PO8	PO9	P01	0 PO	11 F	<u>2012</u>	
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C02	3	2	2	2	2	3	3		3	3	2	, ,	<u>2</u> 1	
C04	3	3	3	3	3	3	3	3	3	3	$\frac{1}{2}$	2	2	
CO5	3	3	3	3	3	3	3	3	3	3	2		2	
COs/PSOs		P	SO1	-	_	P	502	_		ŀ	SO3			
CO1			3				2				2			
CO2			3				3				3			
CO3			3				3				3			
CO4			3				3				3			
CO5			3				3				3			
3/2/1 Indicates	tes Strength of Correlation, 3–High, 2-Medium, 1-Low													
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		Scie	seri es	nitié Sci			ml	Elec	scif		Jom	-	al	
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got		Bas	En£ Scit	Hun Soc	D*:0		Pro	Opé	Inte		Ski		Fra	
ate	F	· 7				\checkmark								
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Course Code: Course Name: SOLAR ENERGY CONVERSION **TECHNIQUES**

SOLAR RADIATION AND COLLECTORS UNIT I

Solar Radiation-Solar angles - Sun path diagrams - shadow determination - Solar Collectors - flat plate collector thermal analysis - heat capacity effect - testing methods-evacuated tubular collectors - concentrator collectors-classificationtracking systems-compound paraboli concentrators-parabolic trough concentrators -concentrators with point focus-Heliostats - performance of the collectors

APPLICATIONS OF SOLAR THERMAL TECHNOLOGY **UNIT II**

Prerequisite: Energy Utilization and Conservation

Principle of working, types - design and operation of - solar heating and cooling systems - solar water heaters - thermal storage systems-solar still-solar cooker -domestic, community- solar pond - solar drying

UNIT III SOLAR PV FUNDAMENTALS

Solar cells - p-n junction: homo and hetro junctions - metal-semiconductor interface - dark and illumination characteristics -efficiency limits- variation of efficiency with band-gap and temperature -efficiency measurements-high efficiency cells -preparation of metallurgical, electronic and solar grade Silicon-production of single crystal Silicon: Czokralski(CZ)and Float Zone(FZ) method

UNIT IV SOLAR PHOTO VOLTAIC SYSTEM DESIGN AND APPLICATIONS

Solar cellar ray system analysis and performance prediction- Shadow analysis: reliability- solar cellar ray design concepts-PV system design-design process and optimization-voltage regulation-maximum tracking - use of computers in array design - quick sizing method - array protection and troubleshooting - standalone -hybrid and grid connected system - System installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems

UNIT V SOLAR PASSIVE ARCHITECTURE

Thermal comfort - heat transmission in buildings- bioclimatic classification – passive heating concepts: direct heat gain - indirect heat gain - isolated gain and sunspaces - passive cooling concepts: evaporative cooling -application of wind, water and earth for cooling; shading - paints and cavity walls for cooling - roof radiation traps - earth air-tunnel. – energy efficient landscape design - thermal comfort - concept of solar temperature and its significance- calculation of instantaneous heat gain through building envelope

TEXT BOOKS

EBEE22E05

- Sukhatme SP, (1984), Solar Energy, TataMcGraw Hill 1.
- Kreider, J.F. and Frank Kreith, (1981), Solar Energy Handbook, McGrawHill 2.

REFERENCE BOOKS

- Garg HP., PrakashJ., (2000), Solar Energy: Fundamentals & Applications, TataMcGrawHill 1.
- 2. S.T. Rama, E. Sheeba Percis, A. Nalini, S. Bhuvaneswari, (2017), Handbook on Standalone Renewable Energy Systems, 1stEdn, Research India Publication ISBN No 978-93-87374-12-6
- 3. AlanLFahrenbruch and Richard H Bube, (1983), Fundamentals of Solar Cells: PV Solar Energy Conversion, Academic Press
- 4. Larry D Partain, (1995), Solar Cells and their Applications, John Wiley and Sons, Inc.



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Total No. of Periods:45

Course Code: EBEE22E06	Cours	e Name: G	REEN	GY	1	Fy/ Lb/ ETL/IE	L	4 r	T/SLr	P/R	C				
	Prerec	quisite: No	one							Ту	3	;	0/0	0/0	3
L: Lecture T: T	utorial	SLr: Super	vised Le	arning P:	Project	R: Res	sear	ch C: C	redits						<u> </u>
T/L/ETL:Theor	y/Lab/I	Embedded	Theory a	and Lab	-										
OBJECTIVES															
 To edu 	acate th	e concept	of Green	Building	5										
To une	derstan	d the Desig	gn conce	pts of Gre	en Bui	ding									
To atta	ain kno	wledge on	reductio	n of carbo	on footi	ng									
To imp	part the	importanc	e of Env	rironment	al issue	S									
To exp	olore th	e future tre	ends in C	reen Buil	lding ar	d to re	van	np the ec	cological	l design.					
COURSEOUT	COMI	ES(Cos)													
Students comple	eting th	is course v	vere able	to											
C01	Unders	stand the c	oncept of	f green bu	uilding										
CO2	Summ	arize the ir	nportanc	e of gree	n buildi	ng and	red	uction o	f carbon	footing					
CO3	Solve t	the issues i	n the gre	en buildi	$\frac{\text{ng to m}}{1}$	eet the	den	nand .	1.						
CO4	Implen	nent the co	oncept of	green bu	ilding i	the pl	ace	s require	ed in a c	ost-effect	ive r	nan	ner		
CO5 Manning of Co	Design	a Green b	th Dree	with the u	se of la	$\frac{100}{100}$	IS								
COs/POs	Durse U	ve Outcome with Program Outcome (POs)01PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12													
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	3	2	2	2	2	2		3	2	2		,).	$\frac{3}{2}$		3
CO3	3	3	2	3	2	2		3	3	2		2	2		3
CO4	3	2	2	2	3	2		2	2	3		2	2		$\frac{c}{2}$
CO5	3	2	2	2	2	3		3	2	2		3	3		3
COs /PSOs		PS	01]	PS($\mathbf{D2}$				PS	03		
CO1			3				3	_					3		
CO2			2				3						2		
CO3			2				3					(3		
CO4			2				2					1	2		
CO5			3				3						2		
3/2/1 Indicates	Strengt	th of Corre	lation, 3	–High, 2-	Mediur	n, 1-Lo	W			-					
	c Sciences neering Sciences nces ram Core ram Electives							m Electives	Electives	sciplinary			omponent		al / rroject
Category	Basic (Basic (Engine Engine Scienc Progra Open]										Skill C		Fracut		

B. Tech – Electrical and Electronics Engineering (Part Time – 2022 Regulation)

UNIT I INTRODUCTION TO GREEN BUILDING

Basics of Green-Sustainable Design–ecological Design–Green Design–Green Buildings-Progress & Obstacles-High Performance Green Buildings

UNIT II DESIGN OF GREEN BUILDING

Prerequisite: None

Foundations of Green Building-Environmental Concerns-Assessment-Design process-green building –execution project-Heat Island Mitigation–Sustainable sites

UNIT III REDUCTION OF CARBON FOOTING

Building energy Issues – Design Strategy – Renewable Energy Systems- Smart Building & energy Management Systems -Reducing the Carbon footprint

UNIT IV ENVIRONMENTAL ASPECTS

Hydrological cycle-Sustainable storm water management-Construction Operations and commissioning of Green Building –Construction & Demolition Waste Management- Indoor Environmental Quality

UNIT V FUTURE TRENDS

Economics in Green Building–Managing First costs–Financial Barriers-Articulating Performance goals for future Green Buildings– Revamping Ecological Design

Total No. of Periods: 45

Tv

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TEXT BOOKS

- 1. Charles J. Kibert Sustainable Construction: Green Building Design and Delivery, 3rd Edition Wiley Publisher, (2012) ISBN:978-0-470-90445-9
- 2. Francis D, K, Ching, IanM, Shapiro, Green Building Illustrated, Wiley

REFERENCE BOOKS

- 1. Sam Kubba, Handbook of Green Building Design, and Construction, Elsevier Publisher (2012) ISBN:978-0-12-385128-4
- Charles J. Kibert, Martha C. Monroe, Anna L. Peterson, Richard R. Plate, Leslie Paul Thiele, WorkingToward Sustainability: Ethical Decision –Making in a Technological World, Wiley Publisher, ISBN :978-0-470-53972-9
- 3. S. T. Rama, E. SheebaPercis, A. Nalini, S. Bhuvaneswari, (2017), Handbook on Standalone Renewable Energy Systems, 1st Edn, Research India Publication ISBN No 978-93-87374-12-6

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University with Gra	ded Autonomy Status	
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(An ISO 21001 : 2018 Certified Institution) Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India. Course Code: EBEE22E06 Course Name: GREEN BUILDING TECHNOLOGY Ty/ Lb/ ETL/IE L T/SLr P/R C

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Course Code: EBEE22E07	Cour APP	Course Name: NEURAL NETWORKS AND ITSTy/ Lb/ ETL/IELT/SLrP/RCAPPLICATIONTy30/00/03													
	Prer	equisite: N	None						Ту	3	0/0	0/0	3		
L : Lecture T : 7	Futori	al SLr : Su	upervised	1 Learning	g P: P	Project R :	Research	C : Cred	its				.I		
T/L/ETL:Theor	y/Lab	/Embedde	d Theory	y and Lab											
OBJECTIVES															
To kno	ow the	e fundame	ntals of l	Neural net	twork	K									
• To lea	rn the	theories of	of Neural	network											
To lea	rn the	architech	ture of n	eural netw	vork										
• To lea	rn the	control us	sing Neu	ral Netwo	ork		_			_					
• To app	oly the	e Neural n	etwork f	or control	of va	arious para	ameters fo	or differen	nt applica	tion					
COURSE OUT	CON	IES(Cos)		1. (.											
Students comple		mize the f	e were at	ne lo		aturanla									
	Close	ify the the		Nourol ne											
CO2	Ulass	mont the	know the	neural ne		K f nourol n	otwork								
	Imple	ment the	control n	ande usin	$\frac{1000}{0}$	ural netwo	rk theory								
C04	Appl	v the Neur	al netwo	rk for cor	g net	of various	naramete	ers for diff	erent and	licatio	n				
Manning of Co	mrse	rse Outcome with Program Outcome (POs)													
COs/POs	PO	e Outcome with Program Outcome (POs) D1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12													
C01	3	3	2	2	2	3	3	1	3	2	3		3		
CO2	2	3	3	3	3	3	2	2	2	2	2		3		
CO3	3	3	3	3	3	3	3	2	3	2	2		3		
CO4	2	3	3	3	3	3	2	2	2	3	2		3		
CO5	3	3	3	3	3	3	2	2	2	2	3		2		
COs /PSOs		P	SO1			I	PSO2]	PSO3				
CO1			2				3				3				
CO2			3				3				2				
CO3			3				3				3				
CO4			3				3				2				
CO5			3				3				2				
3/2/1 Indicates	es Strength of Correlation, 3–High, 2-Medium, 1-Low														
				_											
		Sciences	neering Sciences	anities and Social	sec	am Core	am Electives	Electives	lisciplinary		Component	2001 / D			
gor		asic	ııgi	nmi	cier	1g0	1g0	pen	terc		áll	6	act		
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Course Name: NEURAL NETWORKS AND ITS

FUNDAMENTALS OF NEURAL NETWORKS Introduction- Basic Structure of a Neuron- Model of Biological Neurons-Elements of Neural Networks Weighting Factors-Threshold-Activation Function.

UNIT II NEURAL NETWORKS THEORY

APPLICATION

Prerequisite: None

ADALINE- Linear Separable Patterns- Single Layer Perceptron- General Architecture- Linear Classification-Perceptron Algorithm-Multi-Layer Perceptron General Architecture-Input-Output Mapping.

UNIT III **NEURAL NETWORK ARCHITECTURE**

Introduction- NN Classifications- Feed forward and feedback networks- Supervised and Unsupervised Learning Networks- Back Propagation Algorithm- Delta Training Rule-Radial Basis Function Network (RBFN)-Kohonen Self Organization Network-Hopfield Network.

UNIT IV NEURAL NETWORKS FOR CONTROL

Schemes of neuro-control – identification and control of dynamical systems – adaptive neuro controller – casestudy.

UNIT V APPLICATION OF NEURAL NETWORKS

Introduction -Application of neural network in Design of digital filters- computer networking -Electrical Fault Diagnosis.

Total No. of Periods:45

TEXT BOOKS

Course Code:

EBEE22E07

UNIT I

- 1. AliZilouchian MoJamshidi, (2000) Intelligent Control Systems Using Soft Computing Methodologies.
- 2. Englewoodcliffs, N.J. Laurance Fausett, (1992) Fundamentals of Neural Networks. Prentice Hall.

REFERENCE BOOKS

- 1. Tsoukala, L.H. and RobertE.Uhrig, (1997) Fuzzy and Neural approach in Engineering. John Wiley and Sons.
- 2. JacekM.Zurada, (1997) Introduction to artificial Neural Systems. Mumbai: Jaico Publishing House.
- 3. Millon, W.T. Sutton, R.S. and Webrose, P.J.(1992) Neural Networks for control.MIT: Press.





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Course Code: EBEE22E08	Course	e Name:	DIGITAI	SIGNA]	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С			
	Prereq	uisite: (Control Sy	stems					Ту	3	0/0	0/0	3
L : Lecture T : 7	Tutorial	SLr : St	pervised I	earning	P: Proje	ect R : R	esearch	C : Credit	s				
T/L/ETL: Theorem	ry/Lab/l	Embedde	ed Theory	and Lab									
OBJECTIVES	•												
•	To und	lerstand	the fundan	entals of	signal	s & syst	ems.						
•	Impart	knowled	dge on Z-tr	ansform	concep	ts.							
•	To Un	derstand	the Design	ing of si	gnals u	sing filt	ers.						
•	To ava	il the kn	owledge of	n design	IIR and	FIR fil	ters with	Fourier se	eries meth	nod			
•	To und	lerstand	the Archite	cture and	d featur	es of va	rious sig	nal proces	sing chip	S			
COURSE OUT	ГСОМІ	ES(Cos)											
Students compl	eting the	is course	e were able	to									
CO1	Recall	the fund	amentals of	f signals	& syste	ems.							
CO2	Compr	ehend an	id impart k	nowledg	e on Z-	transfor	m concep	ots					
CO3	Analyz	e the por	wer spectru	im using	various	signal	processin	ig techniq	ues				
CO4	Design	and stuc	ly of vario	is techni	ques in	volved i	n filters	<u> </u>					
CO5	Scrutin	ize the a	rchitecture	and feat	ures of	various	signal pr	ocessing	chips				
Mapping of Co	ourse O	Irse Outcome with Program Outcome (POs)											
COs/POs	P01	<u> </u>	2 PO3	P08	PO9	P01	0 PO	11	2012				
	3	2	2	2	3	3	2	2	2	3	2		1
	3	2		2	2	3	3	3	3	3	2	r	2
C03	3	3	3	3	3	3	3	3	3	3	2	r	2
<u> </u>	3	3	3	3	2	3	3	3	3	3	2	r	2
	3	<u> </u>	3	3	3	3	3	3	3	<u> </u>		r	2
		P	<u>501</u>			ł	<u>502</u>			P	<u>803</u>		
			3				2				2		
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C04 C05			3				$\frac{3}{2}$				3		
2/2/1 Indicates	Strongth	of Corr	Jalation 3	High 21	Modium	1 Lov	3				3		
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egc								0 ¹	Int			ĥ	۲ ۲
Cate													

Course Code: Course Name: DIGITAL SIGNAL PROCESSING T/SLr P/R Tv/Lb/ L С **EBEE22E08 ETL/IE Prerequisite:** Control Systems Ty 3 0/00/0 3

(An ISO 21001 : 2018 Certified Institution)

UNIT I DISCRETE TIME SIGNALS AND SYSTEMS

Periodic and pulse signals- examples of sequences-pulse step, impulse, ramp, sine and exponential-differential equations -linear time in variant-stability, causality -DT systems -time domain analysis

UNIT II **Z-TRANSFORM AND DFT**

Z-transform and its properties – convolution – inverse Z-transform – discrete Fourier series – properties –sampling the Z-transform – Discrete Fourier Transform – properties for frequency domain analysis – linear convolution using discrete Fourier transform- overlap add method, overlap save method

UNIT III FAST FOURIER TRANSFORM (FFT)

Introduction to Radix 2 FFT's – decimation in time FFT algorithm – decimation in frequency FFT algorithm – computing inverse DFT using FFT- mixed radix FFT algorithm

UNIT IV IIR AND FIR FILTER DESIGN

Classification – reliability constrains– IIR design – bilinear transform method – impulse invariant method–step– in variance method-FIR design-Fourier series method- window function method

UNIT V PROGRAMMABLED SP CHIPS

Architecture and features of TMS320C50, TMS3201 and ADSP2181 signal processing chips

Total No. of Periods: 45

TEXT BOOKS

- 1. OpenheimA.V., and SchaferR.W., Discrete Time Signal Processing, Prentice Hall of India, NewDelhi,1992
- 2. ProakisJ.G. and Manolakis, D.G., Digital Signal Processing Principles, Algorithms and Applications, Prentice Hall of India, New Delhi, 1997

REFERENCE BOOKS

- 1. Antonian A., Digital Filters analysis and Design, TataMcGraw-Hill PublishingCo., NewDelhi, 1988
- 2. Stanley W.D., Digital Signal Processing, Restion Publishing House, 1989.
- 3. ADSP2181 Datasheet



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Course Code: EBEE22E09	Cour SYSI	se Name: FEM	RESTR	UCTUR	ING	OF DIS	STRI	BUTIO	N	Ty/ ETI	Lb/ L/IE	L	T/SLr	P/R	C
	Prer	equisite: T	ransmi	ssion and	Dist	tribution	n			ſ	y	3	0/0	0/0	3
L : Lecture T : '	Tutori	al SLr : Su	pervised	l Learning	g P: F	Project R	R : Re	esearch (C : Cre	edits			I	1	1
T/L/ETL: Theo	ry/Lal	o/Embedde	ed Theor	y and Lat)	-									
OBJECTIVES	5														
• To stu	dy ab	out Distrib	ution sy	stem and	Load	l Pattern									
• To im	part k	nowledge	on the D	istribution	n feed	der									
• To res	tructu	re the Dist	ribution	network a	and e	extent co	ntrol	for Low	v volta	ige ne	etwork				
• To une	dersta	nd the self	-healing	control te	chni	ques									
• To atta	ain co	nfidence o	n Auton	nation in I	Distri	bution f	ield								
COURSE OUT	ΓCON	IES(Cos)		_											
Students compl	eting	this course	were ab	ole to	1 ·	1 1 .	1 0	1	•						
	Reco	gnize the c	listributi	on networ	rk 1nc	cluding t	the fe	eder, ma	ains						
<u>CO2</u>	Class	ify the var	1005 feed	ders and s	elf-h	ealing co	ontro	I metho			1 (4	
CO3	Anar	ze the fau	It in the	distributio	on ree	eder and	i resti	ructure t	he net	work	and aut	omize	e the di	stribu	tion
<u> </u>	Desid	DIK m a distrib	ution sv	stem in th	e nat	h of sm	art or	id with	use of	mode	ern tool				
C04	Simu	late their s	tructure	distribut	ed ne	etwork a	nd id	lentify tl	ne issu	les in	volved i	n it			
Mapping of Co	ourse	se Outcome with Program Outcome (Pos)													
COs/POs	PO1	PO2	PO3	PO4	PC	D5 P	PO7	PO	08	PO9	PO1	0 PO	11	PO12	
CO1	3	3	2	3		3	3	3		2	3	3	3		2
CO2	2	3	3	2	2	2	2	3		3	2	2	3		3
CO3	3	3	2	3	1	3	3	3		2	3	3	3		2
CO4	2	3	2	2	2	2	2	3		2	2	2	3		2
CO5	2	2	3	3		3	2	2		3	3	2	2		3
COs /PSOs		P	501				PS	502]	PSO3		
CO1			3					3					3		
CO2			2					2					3		
CO3			3					3					3		
CO4			2					2					3		
CO5			3					2					2		
3/2/1 Indicates	Streng	gth of Corr	elation,	3–High, 2	-Mea	dium, 1-	Low								
	ctives ces														
gory		Basic Scienc	Engineering	Humanities Sciences Program Co Program Ele					Onen Flectiv	about traces	Interdisciplin		Skill Compo		Practical / Pr
Caté								\checkmark							

UNIT I INTRODUCTION TO DISTRIBUTION SYSTEM

Development of Power Distribution Network -Load Growth and Diversified Demands - Load Modeling- Load Demand Forecasting -Self healing Techniques - Line parameters- Overhead lines, Insulators and Supports-Cables-Insulation Resistance- Voltage drop and Power loss in Conductor

UNIT II DISTRIBUTION FEEDER

Primary Distribution system – Secondary Distribution system – Design Considerations - Substation location and planning-Feeder Loading-Voltage drop considerations-Drop with different loadings-Voltage drop constant with different loading

UNIT III **RESTRUCTURING THE NETWORK**

Design of Network – Voltage selection – Sizing –Voltage control- Current loading- Earthing –Cost Factor – LV Distribution Networks - Switchgear for Distribution Substation and LV Networks-Extended Control of Distribution Substations and LV Network

UNIT IV SELF HEALING CONTROL

Self-Healing -Principle -Characteristics- Control method - Urban Distribution network self-healing control method based on Quantity of State-Based on Distributed Power and Microgrid-Based on Coordination Control model

UNIT V AUTOMATION IN DISTRIBUTION SYSTEM

Implementation of Distribution Network self-healing – Relay Protection Units – Basic Requirements – Self Adaption - SCADA / RTU- History and Development of SCADA -Principle and Operation - Automation of Distribution System- PMU/WAMS and SCADA/EMS-Application of PMU or WAMS

Total No. of Periods: 45

TEXT BOOKS

- 1. Kamaraju, V (2009), Electrical power Distribution System, Tata McGrawHill
- Abdelhay A, Sallam, Om, P, Malik, (2011), Electric Distribution Systems, Wiley 2.

REFERENCE BOOKS

- 1. XinxinGu, NingJiang (2017), Self-Healing Control Technology for Distribution Networks, Wiley
- James Northcote-Green, Robert Wilson, Control and Automation of electrical Power Distribution Systems, 2. **Taylor & Francis**

(An ISO 21001 : 2018 Certified Institution) val. Chennai-95. Tamilnadu, India Perivar F.V.R. High Road, Madurav

Course Code: EBEE22E09	Course Name: RESTRUCTURING OF DISTRIBUTION SYSTEM	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
	Prerequisite: Transmission and Distribution	Ty	3	0/0	0/0	3

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Course Code: EBEE22E10	Course TECH	e Name: I NOLOG	DG & EL Y	ECTRICA	AL STO	RAG	E		Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
	Prereq	uisite: Si	mart grid	and Elect	ric Veh	icle T	echnolog	gy	Ту	3	0/0	0/0	3
L : Lecture T : Tu	utorial S	Lr : Supe	ervised Lea	arning P: F	Project R	: Res	earch C	: Credits	s T/L/ETL	.:			
Theory/Lab/Emb	edded T	Theory an	d Lab	Ç	U								
OBJECTIVES													
To study	y about	the Energ	gy Storage	Technolog	gy								
To know	w the wo	orking Pr	inciple of 2	Batteries a	nd its ty	pes							
To impa	art know	ledge on	Fuel Cells	s along wit	th its adv	vantag	ge and dis	sadvanta	iges				
To analy	yze vari	ous types	of energy	storage de	evices.								
To have	e a wide	spread ki	nowledge	on Electric	vehicle	e							
COURSE OUT	COMES	S(Cos)											
Students complet	ing this	course w	ere able to)									
CO1	Recogn	ize the va	arious ene	rgy resourc	ce availa	ible ai	nd its abu	indance					
CO2	Summa	arize the c	concept of	Distribute	d Gener	ation,	Batterie	s, Fuel C	Cell and E	lectric	Vehicle	e	
CO3	Model	a Microg	rid and dea	sign an ele	ctric sto	rage t	echnolog	gy					
CO4	Paraph	rase the a	lternate en	ergy sourc	e in Dis	tribut	ed Gener	ation					
CO5	Demon	strate the	operation	of the Dis	tributed	gener	ation and	d variou	s types of	energ	y storag	e syst	tem
Mapping of Cou	irse Out	utcome with Program Outcome (POs)											
COs/POs	PO1	Dutcome with Program Outcome (POs)1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11											PO12
CO1	3	2	3	3	3	3	2	3	3	3	3	;	2
CO2	3	3	2	2	2	3	3	2	2	2	3	;	3
CO3	3	2	3	3	3	3	2	3	3	3	3	;	2
<u>CO4</u>	3	2	2	2	2	3	2	2	2	2	3	;	2
<u>CO5</u>	2	3	3	3	2	2	3	3	3	2	2		3
COs /PSOs		P	SO1				PSO2				PSO3		
<u>CO1</u>			3				3				3		
CO2			2				2				3		
<u>CO3</u>			3				3				3		
<u>CO4</u>			2				2				3		
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5/2/1 Indicates S	urengin	of Correl	ation, $3-F$	ngn, 2-me	dium, i	-LOW							
ategory		Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core		Program Electives	Open Electives	Interdisciplinary		Skill Component		Practical / Project
Ü						γ							

Conventional Power generation – Advantages and disadvantages – energy crisis – non-conventional energy resources -review of solar, Wind energy system, biomass, tidal sources

UNIT II DISTRIBUTED GENERATION

Concept of distributed generation – topologies – selection of sources – regulatory standards – Security issues in DG implementation – Energy storage element - Necessity of energy storage – types of energy storage –comparison of energy storage technologies-Application

UNIT III **BATTERIES & FUEL CELL**

Batteries - Measurement - Storage and types - Fuel Cell - History of fuel cell - Principle of electro chemical Storage - Types - Hydrogen oxygen cells, Hydrogen air cell - Hydrocarbon air cell-alkaline fuel cell -detailed analysisadvantage and drawback of each cell.

UNIT IV ALTERNATE ENERGY STORAGE TECHNOLOGIES

Flywheel - Super Capacitors - Principles & applications, Compressed Air Energy Storage- Concept of Hybrid Storage-Microgrid Economics-Applications

UNIT V **ELECTRIC VEHICLE**

Electric Vehicle – Types – Hybrid Vehicle – Battering Charging – Usage of batteries in Hybrid vehicle – Fundamentals of Electric vehicle modeling- Types of PHEVs and Automotive system

TEXT BOOKS

- 1. Ibrabim Dincer, marcA, Rosen, (2011) Thermal Energy Storage Systems and Applications, 2nd Ed, JohnWiley
- 2. James Larminie, John Lowry (2003), Electric Vehicle Technology Explained, John Wiley & Sons
- 3. Sumedha Rajakaruna, Farhad Shahnia, Arindham Ghosh, "Plug-in-Electric Vehicles in Smart Grid -Integration Techniques", Springer, 2015

REFERENCE BOOKS

- 1. SethLeitman, BobBrant (2013) Build Your Own Electric Vehicle, 3rd Ed, McGrawHill
- 2. S.T. Rama, E. SheebaPercis, A. Nalini, S. Bhuvaneswari, (2017), Handbook on Standalone Renewable Energy Systems, 1st Edn, Research India Publication ISBN No978-93-87374-12-6

Jameslarminie, Andrew Dicks, (2003), Fuel Cell Systems Explained, Wiley

Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India Course Name: DG & ELECTRICAL STORAGE T/SLr P/R **Course Code:** Ty/Lb/ L **EBEE22E10** TECHNOLOGY **ETL/IE** Prerequisite: Smart Grid and Electric Vehicle Technology Ty 3 0/00/0





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Total No. of Periods:45

Course Code: EBEE22E11	Course I	Name: N	MATERIA	AL SCIEN	NCE IN	AV	IATI	ON		T E	「y/ Lb/ CTL/IE	L	T/SLr	P/R	C
	Prerequi Enginee	isite: Ba ring	asic Electi	rical, Elec	tronics	and	Instr	umer	itation	l	Ту	3	0/0	0/0	3
L : Lecture T : 7	Futorial S	Lr : Sup	pervised L	earning P:	Project	R :	Resea	rch C	: Cred	lits			L		1
T/L/ETL: Theorem	ry/Lab/Er	nbedded	l Theory a	ind Lab	U										
OBJECTIVES															
 To gai 	n basic k	nowledg	ge on Cryo	genic Tec	hnology	/									
 To implication 	part know	ledge o	n Super A	lloy and it	s Applic	catic	ons								
To kno	ow the im	portanc	e of Flexil	ole Electro	onics										
• To hav	ve a wide	spread l	knowledge	e about Na	no scier	nce a	and na	no ma	aterial						
• To lea	rn about l	Drone													
COURSE OU'I	COMES	S(Cos)	wara ahla	to											
	Decemir	course v	otomiolo vo	od in Arric	tion										
	Recogniz	$\frac{1}{2}$ e the m	aterials us	eu n Avia	uion	1									
C02	Summari	ze the u	se of supe	r alloy, fle	exible E		onics	1							
C03	Model th	e materi	ial for flex	ible electr	$\frac{1}{1}$	$\frac{1}{1}$	vanote	echno	logy						
CO4	Design L	prone or	any simp	le kind of .	Air Veh	icle									
CO5	Associate	e the ma	iterial scie	$\frac{1}{2}$ nce in Avi	ation										
Mapping of Co	Durse Out	Outcome with Program Outcome (POs)01PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12													0012
	3	PO2	3	PO4	3	r	2	3		0	3	3		<u>, 11</u>	3
	2	2	2	2	3		2 3	2	2	,	2	3		,	2
<u>CO3</u>	3	2	3	3	3		2	3	3	,	3	3			3
CO4	2	2	2	2	3		2	2	2		2	3	2	2	2
CO5	3	3	3	2	2		3	3	3	;	2	2	3	;	3
COs /PSOs	_	P	SO1				PSC)2			I]	PSO3		-
CO1			3				3						3		
CO2			2				2						2		
CO3			3				3						3		
CO4			2				2						2		
CO5			3				3						2		
3/2/1 Indicates	Strength	of Corre	elation, 3–	High, 2-M	ledium,	1-L	OW							1	
				П											
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egory		Basic S	Enginee	Humani Science	Progran		Program	0	Open E		Interdise		Skill Cc		Practica
Cat															

Course Code:
EBEE22E11Course Name: MATERIAL SCIENCE IN AVIATIONTy/ Lb/
ETL/IELT/SLrP/RCPrerequisite: Basic Electrical, Electronics and InstrumentationTy30/00/03

UNIT I INTRODUCTION TO CRYOGENIC TECHNOLOGY

Terms & Phenomena associated with Cryogenic Systems – Prominent contributors- Critical Aspects and Issues involved – Benefits from Integration – Early applications of Cryogenic Technology- Gas Separation process – Industrial Applications of Cryogenic fluid technology

UNIT II SUPER ALLOY

Introduction-Basic Metallurgy-characteristics & Facts-Properties-Microstructure-Strengthening-Melting & Conversion-Investment casting- Corrosion & Protection of Super Alloy-Applications

UNIT III FLEXIBLE ELECTRONICS

History – Materials for Flexible Electronics – Degrees – Substrates – Backplanes Electronics – Front plane Technologies – Encapsulation - Fabrication Technology – Sheets by batch Processing and Web by Roll-to-Roll Processing

UNIT IV NANOSCIENCE AND NANOTECHNOLOGY

Nano – Current Technologies – Energetics – Implications – Electron Microscopes – Optical Microscopes – Photoelectron Spectroscopy for the study of nano materials – Metal clusture and nano particles – nano crystals – Raman Scattering– Basics of nanomaterials

UNIT V DRONE AND AIR VEHICLE

Introduction–Types of flying drones–Current Uses–Drone Components–Concept sand Systems–Regulations & Safety – Applications– Future Trends

Total No. of Periods :45

TEXT BOOKS

- 1. Jha, AR, (2006), Cryogenic Technology and Applications, Elsevier
- 2. John, KTien, Super alloys, Super composites and Super ceramics, Elsevier
- 3. WilliamS, Wong, Alberto Salleo, Flexible Electronics: Materials and Applications, Springer
- 4. Pradeep, T, (2012) Nanoscience and Nanotechnology, McGrawHill

REFERENCE BOOKS

- 1. Mattew, JD, StephenJD, Superalloys, A Technical guide, 2nd Ed, ASM International.
- 2. MurtyBS, Shankar. P, Baldev Raj, BBRath, James Murday, Nanoscience and Nanotechnology, Springer
- 3. Robo kingdom LLC, (2016) Drone Book



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Course Code: EBEE22E12	Cour	se Name	: POW	ER P	LAN	NT IN	ISTRUM	ENTA'	TION	I	Ty ET	/ Lb/ TL/IE	L	T/SL	r P/I	R C
	Prer	equisite:	Measu	remei	nts a	nd Ir	strumen	tation				Ту	3	0/0	0/0	0 3
L : Lecture T : 7	Tutori	al SLr : S	upervis	ed Le	arni	ng P:	Project R	: Resea	arch (C : C	Credits					
T/L/ETL:Theor	y/Lab	/Embedd	ed Theo	ory an	ld La	ıb										
OBJECTIVES	5															
• Fa	milia	rity to Bu	ilding b	locks	and	boile	rs.									
• Ca	apable	e to measu	ire Elec	trical	para	ameter	rs.									
• Ca	apable	e to analyz	ze vario	us pa	rame	eters i	n power j	olants								
• U1	nderst	and the co	ontrol lo	oops i	in bo	oiler										
• Ca	apable	e to monit	or and c	contro	ol the	eir nev	w able en	ergy sys	stems							
COURSE OUT	ГCON	AES(Cos))													
Students compl	eting	this cours	e were	able t	0											
CO1	Recog	gnize the v	arious P	ower l	Plant	s, Mea	asurements	s, contro	l loops	s, tu	rbine m	onitoring	g and (Control		
CO2	Classi	ify the vari	ious type	es of P	Power	r plant	s based on	the ana	lyze ra	and o	control t	techniqu	es			
CO3	Parap	hrase the r	neasurer	nent te	echni	iques,	and analys	se the im	puriti	es, b	oiler op	eration a	and sp	eed con	trol.	
CO4	Mode	l the powe	r plant b	ased o	on the	e curre	ent need fo	or a susta	inable	e soc	iety in a	a cost-ef	fective	e manne	r.	
CO5	Apply	ly the modern techniques required to solve the complex issues in the field e Outcome with Program Outcome (POs)														
Mapping of Co	ourse	Outcome	utcome with Program Outcome (POs) 01 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12													
COs/POs		Potcome with Program Outcome (POs) PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 3 3 2 3 2 3 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3													PO12	
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CO4		2	2	3		2	2	2	2		3	2	2		2	3
CO5		3	3	3		3	3	3	2		2	3	3		2	2
COs /PSOs			PSO1	_				PS	02					PSO3		
CO1			3						3					3		
CO2			2						2					3		
CO3			3						3					3		
CO4			2						2					3		
CO5			3						2					2		
3/2/1 Indicates	Stren	gth of Co	rrelation	n, 3–I	High	, 2-M	edium, 1.	Low	r							
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UNIT I **OVERVIEW OF POWER GENERATION**

Brief survey of methods of power generation – hydro, thermal, nuclear, solar and wind power – importance of instrumentation in power generation- thermal power plants- building blocks- details of boiler process UP & I diagram of boiler- cogeneration.

UNIT II MEASUREMENTS IN POWER PLANTS

Electrical measurements – current, voltage, power, frequency, power factor etc. – non electrical parameters –flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature– drum level measurement-radiation detector-smoke density measurement-dust monitor.

UNIT III ANALYZERS IN POWER PLANTS

Flue gas oxygen analyzer – analysis of impurities in feed water and steam – dissolved oxygen analyzer – chromatography–PH meter – fuel analyzer– pollution monitoring instruments.

UNIT IV CONTROL LOOPS IN BOILER

Combustion control – air/fuel ratio control – furnace draft control – drum level control – main stem and reheat steam temperature control – super heater control – attemperator – de aerator control – distributed control system in power plants-inter lock sin boiler operation.

TURBINE- MONITORING AND CONTROL UNIT V

Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil temperature control-cooling system

TEXT BOOKS

Course Code:

EBEE22E12

- 1. Sam G. Dukelow, (1991) The control of Boilers, instrument Society of America
- 2. Modern Power Station Practice.Vol.6. Instrumentation, Controls and Testing. Pergamon Press. Oxford

REFERENCE BOOKS

- 1. Elonka, S. M. and Kohal, A. L. (1994) Standard Boiler Operations. NewDelhi: McGraw-Hill
- 2. Jain, R.K. (1995) Mechanical and industrial Measurements. Delhi: Khanna Publishers

Course Name: POWER PLANT INSTRUMENTATION

Prerequisite: Measurements and Instrumentation



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Total No. of Periods:45

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Course Code: EBEE22E13	Cours	e Name: S	SAFETY	FOR EL	ECTRIC	CAL F	ENG	INEE	RS T	y/ Lb/ FL/IE	L	T/SLr	P/R	C
	Prerec	quisite: E	ectrical	Engineer	ing Pract	tise la	b			Ту	3	0/0	0/0	3
L:LectureT:Tut	orial SI	Lr: Superv	ised Lear	rning P:Pr	oject R: I	Resear	ch C	: Cred	its					
T/L/ETL:Theor	y/Lab/I	Embedded	Theory	and Lab										
OBJECTIVES														
To atta	ain kno	wledge or	Electric	al Safety										
• To kno	ow abo	ut the ope	ration of	Electrical	Safety E	quipm	ents							
• To lea	rn abou	it the safe	y proced	ures										
• To kno	ow abo	ut the elec	trical saf	ety codes										
• To tra	in the s	tudents or	the Safe	ty training	5.									
COURSE OUT	COM	ES(Cos)												
Students comple	eting th	is course	were able	e to										
CO1	Unders	stand the b	basics of	electrical	safety									
CO2	Summ	arize the c	peration	of safety	equipmen	nt								
CO3	Interpr	et the safe	ety procee	lure and t	raining m	ethod	s for	a sust	ainable so	ciety				
CO4	Perform	n safety e	xperimer	its to creat	te awaren	less an	nong	peopl	e					
CO5	Analyz	halyze the Hazards in the electricity and safety training methods throughout the life												
Mapping of Co	ourse O	e Outcome with Program Outcome (POs)												
COs/POs	P01	e Outcome with Program Outcome (POs)D1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12												
CO1	3	2	3	3	2	3		2	3	3	3	2		3
CO2	2	3	2	2	3	2		3	2	2	3	3	I.	2
CO3	3	2	3	3	2	3		2	3	3	3	2		3
CO4	2	2	2	2	3	2		2	2	2	3	3		2
CO5	3	3	3	3	3	3		3	3	2	2	3		3
COs /PSOs		P	501				PSO)2]	PSO3		
CO1			3				3					3		
CO2			2				2					3		
CO3			3				3					3		
CO4			2				2					3		
CO5			3				2					2		
3/2/1 Indicates	Streng	th of Corr	elation, 3	-High, 2-	Medium,	1-Lov	N			1			. 	
Å		ic Sciences in Sciences intering Scien nanities and Scien and									lical / Froject			
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UNIT I GENERAL PRINCIPLES OF ELECTRIC SAFETY

Prerequisite: Electrical Engineering Practise lab

Electricity and Human Body – Earthing – Grounding – General Inspection and testing requirement for electrical safety equipment–Flash and thermal production– head and Eye Protection – Electricians Safety kits

UNIT II HAZARDS IN ELECTRICITY

Lighting Hazards - Hazardous area –Hazard Analysis – shock effect -Electrical Insulation – Electrical fires –Arc Flash–Arc energy –arcing voltage–Injury and death–Protective Strategies-Electrical safety in hospitals

UNIT III REGULATORY OF SAFETY REQUIREMENT AND STANDARDS

Course Name: SAFETY FOR ELECTRICAL ENGINEERS

Standard Guidelines of Electrical Safety - Risk assessment and Management – Safety against over voltage, extralow and residual voltages – safety practice – Safety Audits – ANSI-IEEE Electrical safety code – Electrical standards at work place – Accident prevention

UNIT IV SAFETY PROCEDURES AND EQUIPMENTS

Residual current detectors - effects of electric and magnetic fields and electromagnetic radiation – electrosurgical hazards – Ground Rods and ground mats - electrical fires and their investigation –wind energy Area Classification –Safety issues with emerging energy sources

UNIT V SAFETY TRAINING METHODS

Introduction – Elements of a Training Program – On the Job Training – Training Consultants and Vendors-Training Program Setup–Step by Step Method electrical safety

TEXT BOOK:

Course Code:

EBEE22E13

1. Electrical safety handbook – John Cadick -McGRAW -HILL, Third Edition



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Total No. of Periods 45

D EDUCATIONAL AND RESEARCH INSTITUTE

University with Graded Autonomy Status (An ISO 21001 : 2018 Certified Institution) Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India.

Course Code: EBEE22E14	Cours AND	e Name: CONTR	WIDE A OL	REA MO	NITOF	RING I	PROTEC	CTION	Ty/ Lł ETL/I	0/] E	[]	Г/SLr	P/R	С
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T/L/ETL:Theor	y/Lab/	Embedde	d Theory	and Lab										
OBJECTIVES														
To kno	ow abo	out the Ph	asor Meas	urement U	Jnit and	its imp	ortance							
To imp	part kn	owledge	on State E	stimation	and the	Optim	al placen	nent of P	MU					
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To have	ve a wi	de spread	knowledg	ge about tl	he Prote	ection s	chemes a	nd the D	ynamic	mode	el of	Power	Syste	m
To app	ply the	learnt co	ncept for t	he real tin	ne issue	s.								
COURSE OUT	ГСОМ	ES(Cos)												
Students comple	eting tl	nis course	were able	e to										
CO1	Recog	nize the I	Phasor Me	asuremen	t Unit									
CO2	Summ	arize the	state estin	nation, PN	4US, W	ide Are	ea Measu	rements,	Smart	Grid				
CO3	Desig	n a Smart	Grid for t	he sustain	able soc	ciety								
CO4	Demo	nstrate th	e operation	n of the P	MU the	re by th	e monito	ring of S	Substatio	n				
CO5	Analy	ze the trai	nsmission	and distri	bution of	optimiz	ation in t	he Smar	t Grid					
Mapping of Co	ourse (Putcome with Program Outcome (POs)												
COs/POs	PO1	rse Outcome with Program Outcome (POs) PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9											11 P	012
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CO2	3	3	3	3	2	3	3	3	2		3	3		3
CO3	3	2	3	3	3	3	2	3	3		3	2		3
CO4	3	3	2	3	2	3	3	2	2		3	3		2
CO5	2	2	2	3	3	2	2	2	3		2	2		2
COs /PSOs		P	SO1				PSO2				P	SO3		
CO1			2				3					2		
CO2			2				3					3		
CO3			3				3					2		
CO4			2				3					3		
CO5	~		3				2					2		
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gory		Basic Sciences	Engineering Sciences	Humanities and Social Sciences			Program Electives	Open Electives		Interdisciplinary		Skill Component	Duration1 / Drainat	riacucai / rivjevi
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AND CONTROL

EBEE22E14

PMU-History of PMU-Basic definition of Synchrophasor, Frequency, Accuracy Indexes-Sensors of PMUs - PMU Architecture-Data Acquisition System-Communication & Data Collector-Distributed PMU-International Standards.

UNIT II STATE ESTIMATION AND PMUS

Introduction - Formulation of the SE problem - SE measurement Model - SE Classification - Role & Impact of PMU in SE – PMU based Transmission System SE and Distribution SE - Optimal PMU Placement – SE Applications - Automation Architecture with integrated PMU Measurement for SE

UNIT III WIDE AREA MEASUREMENT SYSTEMS

Course Code: Course Name: WIDE AREA MONITORING PROTECTION

Prerequisite: Power Quality and Control of Power System

WAMS – Definition, Data resource, Communication Systems, Applications- Monitoring System Components – Substation Configuration and Communication - Substation Monitoring System- Voltage Stability Assessment -Adaptive load shedding-

UNIT IV SMART GRID

Smart Transmission grid-Demands & Requirement-Wide Area Disturbances-SIPS Architecture-Components and Applications - Dynamic Model of large Power system- Eigen Values & Eigen vectors –Optimization model for equilibrium tracing–Q-V Sentivity –Small Signal Stability Analysis

UNIT V WAMPAC APPLICATION

WAMPAC Application in Frequency Stability, Voltage Stability, Transient Stability, Small Signal Stability

Total No. of Periods:45

TEXT BOOKS

- Antonello Monti, Carlo Muscas, Ferdinanda Ponci, Phasor Measurement Units and Wide Area Monitoring 1. Systems, Elsevier
- Alfredo Vaccaro, Ahmed Faheem Zobaa, Wide Area Monitoring, Protection and Control Systems, IET 2.

REFERENCE BOOKS

- 1. Begovic, Miroslav, M, Electrical Transmission Systems and Smart Grids, Springer
- 2. Fahd Hashiesh, Mansour, MM, Hossam E Mostafa (2011), Wide Area Monitoring, Protection and Control, Lambert

(An ISO 21001 : 2018 Certified Institution) val Chennai-95, Tamilnadu, India Perivar F.V.R. High Road, Madurav



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Course Code: EBEE22E15	Cours	e Name:	ROBOTI	CS AN	D A	UTOMAT	TION			Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
	Prere	quisite: B	asic Mecl	nanical	and	Civil Eng	gineerin	ng		Ту	3	0/0	0/0	3
L : Lecture T : 7	Tutoria	l SLr : Su	pervised I	earning	g P: 1	Project R :	Resear	ch (C : Credi	its			1	
T/L/ETL: Theo	ry/Lab/	Embedde	d Theory	and Lab)									
OBJECTIVES														
To int	roduce	the basic	concepts	and part	s of	robots.								
• To une	derstan	d the wor	king of ro	bots and	l var	ious types	of robo	ots.						
• To ma	ke the	students f	amiliar w	th the v	ario	us drive sy	stems of	of ro	bots, sei	nsor sand	their a	pplicati	ons in	
robots	and pr	ogrammi	ng of robo	ts.										
• To dis	cuss th	e various	applicatio	n of rob	oots,	justificatio	on and i	impl	ementat	ion of rob	ots.			
• To stu	dy abo	ut the mai	nipulators	activat	ors a	and gripper	rs and t	heir	design d	considerat	ions			
COURSE OUT Students compl	FCOM eting th	ES(Cos) nis course	were able	to										
CO1	Recog	nize the F	obots and	its part	S									
CO2	Classi	fy the diff	erent type	s of Rol	bots	based on A	Applica	tion						
CO3	Illustra	te the val	rious appli	cation of	of Ro	bots and o	compile	e pro	gram					
CO4	Interp	et the act	uators, ser	sors for	r the	sustainabl	e socie	ty	0					
CO5	Summ	ummarize the manufacturing application, cell design, use of Electric Drives												
Mapping of Co	ourse C	ummarize the manufacturing application, cell design, use of Electric Drives rse Outcome with Program Outcome (POs)												
COs/POs	PO1	PO2	PO3	PO4	PO	D5 PO	6 PC	07	PO8	PO9	PO1	0 PO	11 P	012
CO1	3	3	2	3	2	2 3		3	2	3	2	3	\$	3
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<u>CO5</u>	2	3	2	2	2	2 2		3	3	2	2	2		3
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3/2/1 mulcates	Sucing		ciation, 5		2-1010	Juluin, 1-L	.0 w							
egory	Indicates Strength of Correlation, 3–High, 2-Medium, 1-Tom Humanities Strences Program Core Program Electives Interdisciplinary Interdisciplinary									Skill Component	m	Fractical / Froject		
Cat														

Anatomy of robotics-History & Terminology of Robotics-various generations of robots-degrees of freedom -Asimov's laws of robotics

UNIT II SENSORS IN ROBOTICS

Position sensors-optical, non-optical, Velocity sensors, Accelerometers, Proximity Sensors-Contact, non-contact, Range Sensing, touch and Slip Sensors, Force and Torque Sensors.

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS

Prerequisite: Basic Mechanical and Civil Engineering

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits- end effectors- U various types of grippers-design considerations

UNIT IV ROBOTICS IN MATERIAL HANDLING

General considerations in robot material handling- material transfer application-pick & place operations-machine loading & unloading-characteristics of robot application-Robot cell design-processing operations-Spot welding, Spray painting, Plastic moulding, forging

UNIT V **ROBOTICS IN FUTURE**

Robot intelligence, Advanced Sensors, Capabilities, Telerobotics, Mechanical design Features, Mobility, locomotion and Navigation-the universal Hand Systems Integration and Networking

Total No. of Periods:45

TEXT BOOKS

- 1. Mikell P. Weiss G. M., Nagel R. N., Odraj N.G., Industrial Robotics, McGraw-Hill Singapore,
- 2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

REFERENCE BOOKS

- 1. Deb. S. R., (1992), Robotics technology and flexible Automation, John Wiley.
- 2. Asfahl C.R., (1992), Robots and manufacturing Automation, John Wiley.
- 3. Klafter R.D., Chimielewski T.A., Negin M., (1994)., Robotic Engineering–An integrated approach, Prentice Hall of India.
- 4. Mc Kerrow P.J.(1991)., Introduction to Robotics, Addison Wesley.
- 5. Issac Asimov (1986.), I Robot, Ballantine Books, New York.



Perivar E.V.R. High Road, Maduravoval, Chennai-95, Tamilnadu, India С Course Code: **Course Name: ROBOTICS AND AUTOMATION** Ty/Lb/ L T/SLr P/R **EBEE22E15 ETL/IE**

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Course Code: EBEE22E16	Course N	Name: IN	IAGE	PROCESS	SING			Ty E1	7/ Lb/ TL/IE	L	T/SLr	P/R	C	
	Prerequi	isite: Nor	ne						Ту	3	0/0	0/0	3	
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T/L/ETL: Theorem	ry/Lab/Er	nbedded	Theory	and Lab										
OBJECTIVES														
• To ap	ply transf	ormation	technic	ques in Dig	ital Imag	ge Proce	ssing							
• To ap	ply techni	ques in i	nage ei	nhancemen	nt, restora	tion, co	mpres	sion, segn	nentatior	n etc				
• To lea	arn image	restoratio	on and i	image com	pression									
• To lea	arn the fur	ndamenta	ls of in	age funda	mental ar	nd use of	f filter	s for imag	ge enhand	cemer	nt			
• To im	plementir	ng differe	nt algo	rithm in im	age proc	essing								
COURSE OUT	ICOMES	S(Cos)												
Students compl	eting this	course w	ere able	e to	•									
	Understa	nd the ba	sic of I	mage proce	essing				<u></u>					
<u>CO2</u>	Apply the	e techniq	ues in i	mage enna	ncement,	and to j	proces	s and rest	ore imag	ges				
<u>CO3</u>	Illustrate	the imag	e comp	ression, se	gmentati	on and r	eprese	entation	<u><u> </u></u>	1		4		
<u>CO4</u>	Paraphra	se the fur	damen	tals of ima	ge funda	mental a	ind use	e of filters	for imag	ge enr	nancem	ent		
CO5	Perform (experime	nt on ir	nplementir	ig differe	nt algor	ithm i	n image p	rocessing	g				
Mapping of Co	Durse Out	Putcome with Program Outcome (POs)PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO1223232323232												
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UNIT I DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS

Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformations-Introduction to Fourier Transform and DFT -properties of 2D Fourier Transform -FFT-Separable Image Transforms-Walsh-Hadamard-Discrete Cosine Transform, Haar, Slant-Karhunen-Loeve transforms.

UNIT II **IMAGE ENHANCEMENT TECHNIQUES**

Prerequisite: None

Spatial Domain methods: Basic grey level transformation- Histogram equalization- Image subtraction-Image averaging –Spatial filtering: Smoothing, sharpening filters – Laplacian filters – Frequency domain filters: Smoothing-Sharpening Filters-Homomorphic filtering.

UNIT III **IMAGE RESTORATION**

Model of Image Degradation/restoration process- Noise models- Inverse Filtering-Least mean square filtering -Constrained least mean square filtering-Blind image restoration-Pseudo inverse-Singular value decomposition.

UNIT IV **IMAGE COMPRESSION**

Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding-DPCM. Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG, Basics of vector quantization.

UNIT V **IMAGE SEGMENTATION AND REPRESENTATION**

Edge detection – Thresholding - Region Based segmentation – Boundary representation: chair codes- Polygonal approximation – Boundary segments – boundary descriptors: Simple descriptors-Fourier descriptors – Regional descriptors –Simple descriptors- Texture- Implementation of various algorithms in image processing using related simulation packages.

TEXT BOOKS

EBEE22E16

1. Rafael CGonzalez, Richard E. Woods, (2003) Digital Image Processing.2nd Ed. Pearson Education.

REFERENCE BOOKS

- 1. William K. Pratt, (2001) Digital Image Processing. John Willey.
- 2. Chanda Dutta Magundar, (2000) Digital Image Processing and Applications. Prentice Hall of India:
- 3. Millman Sonka, Vaclavhlavac, Roger Boyle, Broos, colic, (1999) Image Processing Analysis and Machine Vision. Thompson Learning
- 4. Jain, A.K. (1995) Fundamentals of Digital Image Processing. NewDelhi: PHI.





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Total No. of Periods:45



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	Prerequ	isite:]	Power S	System	Protect	tion and	Swi	itchge	ear		Ту	3	0/0	0/0	3
L : Lecture T : '	Tutorial S	SLr : S	upervis	ed Lear	ning P:	Project F	R : R	lesear	ch C	: Credits	T/L/ETI	.: .:			
Theory/Lab/Em	bedded 7	Theory	and La	.b											
OBJECTIVES	5														
• To	o study al	bout th	e impoi	tance o	f Substa	tion and	l its t	ypes		р.					
• 10	o impart k	cnowle	edge on	Gas Ins	sulated S	Substatio	on an	id its	worki	ng Princ	1ple				
• 10	o know th	le worl	king pri	nciple a	and char	acteristic	cs of	Air-	Insul	ated Sub	stations		- 1 T		
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COURSE OU	ГСОМЕ	S(Cos))												
Students compl	eting this	course	, e were a	able to											
CO1	Identify	the co	mponen	ts in th	e Substa	tion									
CO2	Classify	the va	rious ty	pes of S	Substatio	ons and i	ident	tify th	e faul	ts relate	d to it				
CO3	Paraphra	se the	importa	ance of	Gas insi	ulated, A	ir in	sulate	ed sul	ostation a	and substa	ation	integra	tion	
CO4	Illustrate	the di	ifferent	Substat	ion and	design a	is per	r the 1	need f	for a sust	ainable s	ociet	y U		
CO5	Design t	in the substation with all the requirements for a sustainable society													
Mapping of Co	ourse Ou	outcome with Program Outcome (POs)													
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CO2	2		3	2	2	3	í	3	2	2	2	3	3		2
CO3	3		2	3	3	3		2	3	3	3	3	2		3
CO4	2		2	2	2	3		3	2	2	2	3	3		2
CO5	3		3	3	2	2	,	3	3	3	2	2	3		3
COs /PSOs			PSO1					PSC)2				PSO3	,	
<u>CO1</u>			3					2					3		
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Course Code:
EBEE22E17Course Name: SUBSTATION DESIGNINGTy/ Lb/
ETL/IELT/SLrP/RPrerequisite: Power System Protection and SwitchgearTy30/00/0

UNIT I INTRODUCTION TO SUBSTATION AND ITS TYPES

Need for Substation–Budgeting–Traditional & Innovative Substation Design–Site Selection and Acquisition-Station Design–Station Construction–Station Commissioning- bas bar arrangements in Switch yard

UNIT II GAS INSULATED SUBSTATION

Sulfur Hexafluoride – Construction – Circuit Breaker – Current and Voltage Transformers – Disconnect and Ground Switches – Interconnecting Bus – Air, Power Cable and Direct Transformer Connections – Surge Arrester – Control System – Gas monitoring System – Gas compartments and Zones – Electrical & Physical Arrangement– Grounding– Testing–Installation – Operation and Interlocks – Economics.

UNIT III AIR- INSULATED SUBSTATIONS

Introduction – Single and Double Bus Arrangement – Main and Transfer Bus Arrangement – Double Bus-Single Breaker Arrangement – Ring Bus Arrangement – Breaker and a Half Arrangement – Comparison of Configurations

UNIT IV HIGH VOLTAGE POWER ELECTRONIC SUBSTATION

High Voltage Power Equipment - Converter Station (HVDC) – FACTS Controllers – Control & Protection System – Health monitoring and thermal energy, Losses and cooling –Civil works – Reliability and Availability – Future Trends

UNIT V SUBSTATION INTEGRATION AND AUTOMATION

Definitions and Terminology – Open Systems- Architecture Functional Data paths – Substation Integration and Automation Systems–New Vs Existing Substations–Equipment conditioning Monitoring– Substation Integration and Automation Technical issues – Protocol Fundamentals and Considerations – Communication Protocol Application Areas

Total No. of Periods:45

TEXT BOOKS

1. John D, Mc Donald (2007), Electric Power Substations Engineering, 2nd Ed, CRC Press

2. Sunil. S, Rao (2010), Switchgear Protection and Power Systems, 4th Ed. Khanna Publishers

REFERENCE BOOKS

- 1. Khedkar MK, Dhole GM, Electric Power Distribution Automation, University Science Press
- 2. Satnam PS and Gupta PV, Substation Design & Equipment, Dhanpat Rai Publications



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Course Code: EBEE22E18	Course Name INSTRUMEN	: INDU	STRIA DN	L CON	TROL			T E	y/ Lb/ TL/IE	L	T/SLr	P/R	C
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L : Lecture T : 7	Futorial SLr : S	upervise	ed Lear	ning P:	Project R	: Resea	arch C :	Credits	T/L/ETI	L:		1	<u> </u>
Theory/Lab/Em	bedded Theory	and La	b										
OBJECTIVES													
• To	o know about fo	orce, tor	que, ve	locity									
• To	o learn the meas	suremer	nt of acc	eleratio	n, vibrati	on, den	sity and	viscosit	y				
• <u>T</u> e	o understand the	e Pressu	ire and	Temper	ature mea	sureme	nt						
• To	o learn about th	e Contr	ollers a	nd Cony	verters, T	nermoco	ouple w	ith the u	se of mo	odern t	ools		
	o solve the issue	es in the	e industi	y by gi	ving suita	ible soli	ition in	a cost-ei	ffective	manne	r.		
COURSE OUI	ting this cours) A Wara (ble to										
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CO3	Industries	20, (ui)		, erters,	pressure	measu	ennenn v	ind vane	us upph	cution			
CO4	Analyze the Co	ontrolle	rs and C	onverte	rs, Thern	nocoupl	e with t	he use o	f moder	n tools			
CO5	Solve the issue	s in the	industr	y by giv	ing suita	ble solu	tion in a	a cost-ef	fective r	nannei			
Mapping of Co	ourse Outcome	Outcome with Program Outcome (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 PO	11	PO12
CO1	3	3	2	3	2	3	3	3	2	3	2	,	3
CO2	2	2	3	2	3	2	2	3	3	2	3		2
CO3	3	3	2	3	2	3	3	3	2	3	2	,	3
CO4	2	2	3	2	2	2	2	3	3	2	2		2
CO5	3	3	3	3	3	3	2	2	3	3	3		3
COs /PSOs		PSO1				PS	02]	PSO3		
CO1		2				3	3				3		
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3/2/1 Indicates	Strength of Con	rrelatior	1, 3–Hig	gh, 2-M	edium, 1-	Low			1	-			
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UNIT I REGULATORY POWER SUPPLY

Overview of Switching Regulators and switch mode power supplies – Uninterrupted Power Supplies – Solid state circuit breakers-PLC

UNIT II CONTROLLERS AND CONVERTERS

EDUCATION

Prerequisite: Measurements and Instrumentation

Analog Controllers – Proportional controllers – Proportional Integral Controllers – PID Controllers – Feed forward Controllers – Signal Conditioners – Instrumentation Amplifiers – Voltage to Current, Current to Voltage, Voltage to Frequency, Frequency to Voltage Converters – Isolation Circuits

UNIT III PRESSURE MEASUREMENT

Units of pressure - Manometers - Different types - Elastic type pressure gauges - Bourdon type bellows - Diaphragms - Electrical methods - Elastic elements with LVDT and strain gauges - Capacitive type pressure gauge-Piezo resistive pressure sensor-Resonator pressure sensor-Measurement of vacuum-McLeod Gauge-Thermal conductivity gauges - Ionization gauge, cold cathode and hot cathode types - Testing and calibration of pressure gauges-Dead weight tester.

UNIT IV THERMOCOUPLE

Thermocouples – Laws of thermocouple – Fabrication of industrial thermocouples – Signal conditioning of thermocouples output – Thermal block Reference Books functions – Commercial circuits for cold junction compensation–Response of thermocouple–Special techniques for measuring high temperature using thermocouples–Radiation methods of temperature measurement

UNIT V APPLICATION IN INDUSTRIES

Stepper Motors and Servo motors – Control and Application – Servo Amplifiers – Selection of Servo motor and Application–Fibre Optics– Barcode Equipment and Application of Barcode in Industry

TEXT BOOKS

- 1. Doebelin, E.O. (2003) Measurement Systems–Application and Design. Tata McGraw Hill publishing company.
- 2. Jain, R.K. (1999) Mechanical and Industrial Measurements. NewDelhi: Khanna Publishers.
- 3. Michael Jacob, (1988) 'Industrial Control Electronics–Applications and Design', Prentice Hall
- 4. Thomas, E. Kissel, (2003) Industrial Electronics, PHI

REFERENCE BOOKS

- 1. Patranabis, D. (1996) Principles of Industrial Instrumentation. Tata McGraw Hill Publishing Company Ltd.
- 2. Sawhney, A. K. and Sawhney, P. (2004)A Course on Mechanical Measurements, Instrumentation and Control Dhanpath Rai and Co.
- 3. Nakra, B.C.& Chaudary, B.C. Instrumentation Measurement & Analysis. Tata McGraw Hill Publishing Ltd.
- 4. Singh, S.K. (2003) Industrial Instrumentation and Control. Tata McGrawHill.
- 5. Eckman, D.P. Industrial Instrumentation. Wiley Eastern Ltd.



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Total No. of Periods:45



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L : Lecture T : 7	Tutorial S	Lr : Sup	ervised	l Learn	ing P: Pi	roject R	: Resear	ch C :	Credits	T/L/ETL:	1 1			
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CO2	Classify t	the oper	ating m	odes o	f differe	nt types	of Drive	es						
CO3	Estimate	the Pow	ver ratir	ng of th	e Motor	, Drives,	equival	ent sys	stem of	motor				
CO4	Summari scenario	ze the lo	osses in	the Dr	ives sys	tem and	complin	nent th	e usage	of Special	l Drive	es to th	e pres	ent
CO5	Utilize th	e Tracti	on syst	em and	special	Drives f	or a sus	tainabl	e societ	у				
Mapping of Co	ourse Out	Putcome with Program Outcome (POs)												
COs/POs	PO1	l	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 PO	11 I	PO12
CO1	3		2	2	3	3	2	3	2	3	3	2		2
CO2	2		3	3	2	2	3	2	3	2	2	3		2
CO3	3		2	2	3	3	2	3	2	3	3	2		2
CO4	2		3	2	2	2	3	2	2	2	2	3		3
CO5	3		3	3	3	3	3	3	3	3	3	3		3
COs /PSOs]	PSO1				PS	<u>502</u>			F	<u>PSO3</u>		
<u>CO1</u>			3					2				3		
<u>CO2</u>			2					3				2		
<u>CO3</u>			3					2				3		
<u>CO4</u>			2					3				2		
$\frac{CO5}{\frac{3}{2}}$	Strongth	of Corre	3	2 Uial	2 Mod	lium 1 I	OW	3				3		
3/2/1 mulcates	Suengui				1, 2-1viet	11u111, 1-1	20%							
tegory		Basic Sciences	Engineering Sciences		Humanities and Social Sciences	Program Core			Open Electives	Interdisciplinary		Skill Component	-	Practical / Project
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Course Code:

EBEE22E19

Basic drive components classification and operating modes of electric drive, nature and type of mechanical loads, review of speed torque characteristics of electric motors and load, joint speed torque characteristics. Electric Braking: Plugging, dynamic and regenerative braking of DC and AC motors.

UNIT II DYNAMICS OF ELECTRIC DRIVES SYSTEM

Prerequisite: Electrical Machines, Power Electronics

Equation of motion, equivalent system of motor load combination, stability considerations, electro mechanical transients during starting and braking, calculation of time and energy losses, optimum frequency of starting.

UNIT III TRACTION DRIVE

Electric traction services, duty cycle of traction drives calculations of drive rating and energy consumption, desirable characteristics of traction drive and suitability of electric motors, control of traction drives. Energy Conservation in Electric Drive: Losses in electric drive system and their minimization energy, efficient operation of drives, load equalization.

UNIT IV ESTIMATION OF MOTOR POWER RATING

Heating and cooling of electric motors, load diagrams, classes of duty, Reference Books to India standards, estimation of rating of electric motors for continuous, short time and intermittent ratings.

UNIT V SPECIAL ELECTRIC DRIVE

Servo motor drive, step motor drive, linear induction motor drive, permanent magnet motor drive. Selection of electric drive: Selection criteria of electric drive for industrial applications, case studies related to steel mills, paper mills, textile mills and machine tool etc.

TEXT BOOKS

- 1. Dubey, G.K. (1995) Fundamentals of Electric Drive. Narosa Publishing House.
- 2. Chilkin, M. Electric Drive. Mir Publications.

REFERENCE BOOKS

- 1. Pillai, S.K.A first course on Electric Drive. New age international publishers.
- 2. Dev, N.K. Sen, P.K. (1999) Electric Drives. Prentice Hall of India.
- 3. Vedam Subhramanyam, (1994) Electric Drive: Concepts and Applications. Tata McGraw Hill.



Perivar F.V.R. High Road, Maduravoval, Chennai-95, Tamilnadu, India **Course Name: ELECTRIC TRACTION** Ty/Lb/ L T/SLr P/R

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Total No. of Periods:45

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Course Code: EBEE22E20	Course Name ENGINEERI	se Name: ENVIRONMENTAL SCIENCE AND INEERING							Ty/ Lb/ CTL/IE	L	T/SLr	P/R	С	
	None	one						Ту	3	0/0	0/0	3		
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL:														
Theory/Lab/Embedded Theory and Lab														
 To acquire the knowledge about nature and environment To study the importance of environment by assessing its impact on the human world 														
 To study the importance of environment by assessing its impact on the human world To study the integrated themes and biodiversity natural resource, pollution control and waste management 														
 To study the integrated memes and biodiversity, natural resource, ponution control and waste management To learn about the public awareness of environmental science and engineering 														
 To understand the impact of human activities to the environment 														
COURSE OUTCOMES(Cos)														
Students completing this course were able to														
CO1	Implement the scientific and technologies for environmental problems													
CO2	Understand the features of the earth's interior and surface													
CO3	Understands public participation is an important aspect which serves the environmental Protection.													
CO4	Public awareness of environmental science and engineering													
CO5	Understands the impact of human activities to the environment													
Mapping of Co	ourse Outcom	e with Pr	ogram	Outcom	e (POs)			-						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 PO	11 1	PO12	
<u>CO1</u>	3	2	2	3	3	2	3	2	3	3	2		2	
<u>CO2</u>	2	3	3	2	2	3	2	3	2	2	3		2	
<u>CO3</u>	3	2	2	3	3	2	3	2	3	3	2		2	
<u>CO4</u>	2	3	2	2	2	3	2	2	2	2	3		3	
	3		3	3	3	<u>3</u>	3	3	3	3			3	
	PSO1				<u>PS02</u>									
	3				3									
CO3	3				2				3					
CO4	2				3				2					
CO5	3				3				3					
3/2/1 Indicates	Strength of Co	rrelation,	3–High	n, 2-Meo	lium, 1-L	ow			1					
gory	Basic Sciences	Engineering Sciences	Humanities and Social Sciences		Program Core	Program Electives		Open Electives	Interdisciplinary		Skill Component		Practical / Project	
Cate														



Course Code: EBEE22E20	Course Name: ENVIRONMENTAL SCIENCE AND ENGINEERING	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	С
	Prerequisite: None	Ту	3	0/0	0/0	3

UNIT I ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate studies sources. case Land resources: Land as energy a resource. land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets - river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development — urban problems related to energy — water conservation, rain water harvesting, watershed management — resettlement and rehabilitation of people; its problems and concerns, case studies — role of non-governmental organization- environmental ethics: Issues and possible solutions — climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. — waste land reclamation — consumerism and waste products — environment production act — Air (Prevention and Control of Pollution) act — Water (Prevention and control of Pollution) act — Wildlife protection act — Forest conservation act — enforcement

B. Tech – Electrical and Electronics Engineering (Part Time – 2022 Regulation)

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machinery involved in environmental legislation-central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

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Population growth, variation among nations — population explosion — family welfare programme — environment and human health — human rights — value education — HIV / AIDS — women and child welfare — role of information technology in environment and human health — Case studies.

Total No. of Periods:45

TEXT BOOKS

- 1. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004
- 2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.

REFERENCE BOOKS

- 1. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
- 2. Dharmendra S. Sengar, 'Environmental law', Prentice Hall of India PVT LTD, New Delhi, 2007.
- 3. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005
- 4. G. Tyler Miller and Scott E. Spool man, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.