DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech – ELECTRICAL AND ELECTRONICS ENGINEERING

Part I

VISION

The department of EEE constantly strives to provide excellent academic and research ambience for the students and members of the faculty of the department to inherit quality professional education of the international standard with skill for solving real life problems; to inculcate national/global perspective with human dignity and values; to imbibe leadership qualities; and to serve the societal needs at local / national / global levels.

MISSION

To provide a stimulating learning environment with a technological orientation to maximize the Individual potential by acquisition of high quality electrical and electronic engineering concepts through excellent practices in the latest and emerging technologies.

DM1: To educate our students and provide them with the skills they need to meet high standards of excellence in Electrical and Electronics engineering.

DM2: To prepare students for professional careers and advanced studies.

DM3: To teach in and outside the classroom using traditional, innovative methods and pass along knowledge through basic and applied research in Electrical and Electronics Engineering.

DM4: To Serve as a resource of Electrical and Electronics Engineering expertise at the Regional, National and Global levels.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1: PREPARATION:

To provide students with sound fundamental in Mathematical, Scientific and Engineering fundamentals necessary to formulate, analyse, and also to combine fundamental knowledge of engineering principles with modern techniques to solve realistic, unstructured problems that arise in the field of engineering and non-engineering efficiently and cost effectively.

PEO2: CORE COMPETENCE:

To build competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power systems, information and electronics hardware

PEO3: PROFESSIONALISM:

To broaden knowledge to establish themselves as creative practicing professionals, locally and globally, to pursue life-long learning by successfully participating in post graduate or any other professional program for continuous improvement which is a requisite for a successful engineer to become a leader in the work force or educational sector

PEO4: SKILL:

To provide Industry based training for developing professional skills and soft skills such as proficiency in languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS:

To apply the ethical and social aspects of modern Engineering and Technology innovations to the design, development, and usage of new products, systems, gadgets, devices, etc.

MAPPING BETWEEN MISSION Vs PEOs

PEOs/ Missions	DM1	DM2	DM3	DM4
PEO1	✓	✓		
PEO2	✓	✓	✓	✓
PEO3	✓	✓	✓	✓
PEO4	✓	✓	✓	✓
PEO5		✓		✓

PROGRAMME OUTCOMES (POs)

On completion of B.Tech in Electrical and Electronics Engineering Programme, Graduates will have to

(a) Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, andan engineering specialization to the solution of complex engineering problems.

(b) **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methodsincluding design of experiments in electrical and electronics engineering, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.

(c)**Design/Development of Solutions:** Design solutions for complex electrical and electronics engineering problems and designsystem components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

(d) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverseteams, and in multidisciplinary settings.

(e) **Problem Analysis:** Identify, formulate, review research literature, and analyse complex engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences

(f) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of theengineering practice.

(g) **Communication:** Communicate effectively on complex engineering activities with the engineeringcommunity 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.

(h) **Environment and Sustainability:** Understand the impact of electrical and electronics engineering solutions in a global, economic, environmental and social context

(i) **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independentand lifelong learning in the broadest context

of technological change.

(j) **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal,health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

(k) **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modernengineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

(l) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering andmanagement principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PROGRAMME SPECIFIC OUTCOMES

PSO 1: To possess knowledge and hands on experience to give solutions to meet the challenges on increasing energy demand across all sectors, including agriculture, process industry, commercial and residential for generation, transmission, distribution and utilization networks.

PSO 2: To analyze real time problems in industrial sectors and apply appropriate techniques to design processes to resolve issues in Renewable Energy integration, Optimal power distribution, Intelligent forecasting, anticipated power availability position, Inter-state transmission, advanced smart micro grid and Energy management systems with interpersonal skills and entrepreneurship attitude.

MAPPING BETWEEN PROGRAMME EDUCATIONAL OBJECTIVES & PROGRAMME OUTCOMES

PEOs\POs	a	b	c	d	e	f	g	h	i	j	k	l
1	√	√	√		√					√	√	√
2	√		√		√			√			√	√
3	√	√		√	√	√	√	√	√	√	√	√
4		√		√	√	√	√	√	√		√	√
5			√					√				√

PART-II (B.Tech EEE)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech – ELECTRICAL AND ELECTRONICS ENGINEERING

MAPPING BETWEEN COURSE& PROGRAM OUTCOMES

Sem	Courses\POs	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2
I	**THEORY**														
	Communicative English	√			√			√		√				-	-
	Engineering Mathematics –I	√	-		√		-	-		√		-	-	-	-
	Waves and Optics	√			√		-	-		√			-	-	-
	Engineering Chemistry	√			√	-		-	-	√			-	-	-
	Basic Electrical & Electronics Engineering	√	√	√	-	√		-	-	√	-		-	√	-
	Biology for Engineers	√	-		√	-	√		-	√	-		--	-	-
	PRACTICAL														
	Wave Optics & Semiconductor Physics Lab	√	√	√	√	-	-	-		√	√	√	√	-	-
	Chemistry Lab	√	-	√	√	-	-	√	-	√	√	√	-	-	-
	Workshop/Manufacturing Practices Laboratory	√	√	√	√	-	-	-	-	√	-	-	√	-	-
	Basic Electrical & Electronics Engineering Laboratory	√	√	√	-	-	√	-	-	√	-	√	-	√	-
II	**THEORY**														
	Technical English	√			√	-		√		√	-			-	-
	Engineering Mathematics- II	√	-		-	√	-		-	√		√	-	-	-
	Semiconductor Physics	√				√	-	-		√			-	-	-
	Environmental Sciences	√		√		-	√		√	√		-	-	-	-
	Problem Solving and Python Programming	√	√	√	√	-	√	√	-	√	√	√	√	√	√
	Engineering Graphics & Design	√	√	√	√	√	√	√	-	-	-	√	-	-	-
	PRACTICAL														
	Wave Optics & Semiconductor Physics Lab	√	-	√	√	-	-	-	√	√	√	-	-	-	-
	Chemistry Lab	-	-	√	√	-	-	√	-	-	√	√	-	-	-
	Problem Solving and Python Programming Laboratory	√	√		√		√		√	√		√	√	√	√
	THEORY														
	Partial Differential Equation and Transformation	√	√	√	√	√	-	-	√	√	-	√	-	-	-
	Electrical Circuit Analysis	√	√	√	√	-	-	√	-	-	-	√	-	√	-

III	Analog Electronic Circuits	√	√	√	-	-	-	-	√	-	-	√	-	√	-
	Electrical Machines – I	√	√	√	-	-	√	-	-	√	-	√	-	√	--
	Electromagnetic Fields	√	√	-	-	-	-	-	-	√	-	-	-	√	--
	PRACTICAL														
	Analog Electronic circuits Laboratory	-	√	√	-	√	-	-	-	-	√	√	-	√	√
	Electrical Machines Laboratory - I	√	√	√	-	-	√	-	-	√	-	√	--	√	√
IV	**THEORY**														
	Digital Electronics	√	√	√	√	-	-	-	-	--	-	√	-	-	√
	Electrical Machines – II	√	√	√	-	-	√	-	-	√	-	√	-	√	-
	Power Electronics	√	√	√	-	-	√	-	-	√	-	√	-	√	√
	Digital Signal Processing	√	√	√	√	-	-	-	√	√	√	√			
	Probability and Statistics & NM	√	-	-	√	√	-	-	√	-	√	-	-	-	-
	Organizational Behavior	√	√	√	√	-	-	-	√	√	√	√	√	-	√
	PRACTICAL														
	Digital Electronics Laboratory	√	√	√	√	√	-	-	-	-	-	√	-	-	√
	Electrical Machines Laboratory - II	√	√	√	-	-	√	-	-	√	-	√	-	-	√
	Power Electronics Laboratory	√	√	√	-	√	-	-	√	√	√	√	-	-	√
V	**THEORY**														
	Power Systems – I (Apparatus and Modelling)	√	√	√	-	-	-	-	√	-	√	-	-	√	-
	Control Systems	-	√	√	-	√	-	-	√	√	-	√	√	√	√
	Measurements and Instrumentation	√	√	√	√	-	-	√	-	-	-	√	-	√	-
	Electrical Machine Design	√	√	√	-	√	-	-	√	√	-	√	-	√	√
	PRACTICAL														
	Power Systems Laboratory - I	√	√	√	-	-	-	-	√	√	-	√	-	-	√
	Control Systems Laboratory	√	√	-	-	√	√	-	√	√	-	√		-	√
	Measurements and Instrumentation Laboratory	√	√	√	√	-	-	√	-	-	-	√	-	-	√
	THEORY														
	Power Systems – II (Operation and Control)	√	√	√	-	√	√	-	√	√	-	√	-	√	√
	Microprocessors & Microcontrollers	√	√	√	-	-	-	-	√	√	-	√	-	√	√
	Fuzzy Logic and neural	√	√	√	√	√			√	√	√	-	-	-	√

VI	Networks														
	PRACTICAL														
	Power Systems Laboratory - II	√	√	-	-	√	√	-	√	√	-	√		-	√
	Microprocessors & Microcontrollers Lab	√	√	√	-	-	-	-	√	√	-	√		-	√
	Technical Seminar	-	√	-	√	-	-	√	-	-	-	-	√	√	√
	Summer Internship	-	-	-	√	-	√	√	-	-	-	-	√	√	√
VII	**THEORY**														
	Smart Grid	√	√	√	-	-	-	-	-	-	-	√	-	√	√
	PRACTICAL														
	Project Stage-I	-	√	√	√	√	√	-	√	√		√	√	√	√
	Electronics Design Lab	-	-	√	√	√	-	-	√	√	√	√	-	√	√
VIII	**THEORY**														
	PRACTICAL														
	Project Stage-II	-	√	√	√	√	√	-	√	√		√	√	√	√

MAPPING BETWEEN PROFESSIONAL ELECTIVES (PEs) AND PROGRAMME OUTCOMES (POs)

PE	**Courses\SOs**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**
I	Power system Protections	-	√	√	-	√	-	√	-	-	√	-	√	√	√
	Line commutated and Active PWM Rectifiers	√	√	√	-	-	-	-	√	-	√	-	√	√	-
	Utilization of Electrical Energy	-	√	√	√	√	-	√	√	√	-	√	-	√	
	Special Electrical Machines	-	√	√	-	-	-	-	√	-	√	√	-	√	√
II	HVDC Transmission Systems	√	√	√	-	-	√	-	-	√	-	√	-	√	-
	Solid State DC Drives	√	√	√	√	√		√	√	√	√	√	√	√	-
	Distributed generation and Microgrid	√	√	√	√	√	√	-	√	-	-	√	√	√	-
	Micro Controller Based System Design		√	√	-	-	-	-	√	-	√	√	√	√	√
III	High Voltage Engineering	√	√	√	-	√	√	-	√	-	-	√	-	√	-
	Solid State AC Drives	√	√	√	-	√	-	-	√	√	√	√	√	√	-
	Energy Management Systems and SCADA	√	√	√	-	-	√	-	-	√	-	√	√	√	√

	Bio-Medical Instrumentation	-	√	√	-	√	-	-	√	√	-	√	-	√	√
IV	Power Quality	√	√	√	√	√	-	-	√	√	√	-	-	√	-
	Solid State Relays	√	√	√	√	√	√	√	-	√	√	√	√	√	-
	Renewable Energy Sources	√	√	√	√	√	-	-	√	√	√	-	√	√	√
	Industrial Electrical system & Automation	√	√	-	√	-	-	√	-	-	√	-	√	√	√
V	Power System Dynamics and Control	-	√	-	-	√	-	-	√	√	√	-	√	√	-
	Power Converter Analysis and Design	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Electric Power Distribution System	√	√	-	-	√	-	√	√	-	√	√		√	-
	Instrumentation & Controls in Power Plant Industry	√	√	-	√	√	-	√	-	√	-	-	√	√	-
VI	Flexible AC Transmission Systems	√	√	√	-	√	-	√	√	√	-	√	-	√	-
	Power electronics application to renewable energy system	√	√	√	-	-	-	-	√	-	-	-	√	√	√
	Wind & Solar Energy systems	√	√	√	√	√	-	-	√	√	√	-	√	√	√
	Robotics & Automation	√	√	√	-	√	√	√	√	√	√	√	√	√	√

CURRICULUM AND SYLLABUS (R2018)

B-FACT: Bharath - **F**lexible **A**ccommodative **C**hoice **B**ased **C**redit system for **T**echnology

(Applicable to the batches admitted from July 2018)

B.Tech – ELECTRICAL AND ELECTRONICS ENGINEERING

(FULL TIME)

I – VIII SEMESTERS

SEMESTER I								
Sl. No.	**Course Code**	**Category**	**Course Title**	**Contact Period**	**L**	**T**	**P**	**C**
THEORY								
1.	U18HSEN101	HS	Communicative English	4	2	0	2	3
2.	U18BSMA101	BS	Engineering Mathematics - I	4	4	0	0	4
3.	U18BSPH101	BS	Waves and Optics	3	3	0	0	3

4.	U18BSCH101	BS	Engineering Chemistry	3	3	0	0	3
5.	U18ESEE101	ES	Basic Electrical and Electronics Engineering	3	3	0	0	3
6.	U18BSBT101	BS	Biology for Engineers	2	2	0	0	2
PRACTICAL								
7.	*U18BSPH2L2	BS	Wave Optics and Semi-Conductor Physics Lab	3	0	0	3	*
8.	*U18BSCH2L4	BS	Chemistry Lab	3	0	0	3	*
9.	U18ESME1L2	ES	Workshop/Manufacturing Practices Laboratory	5	1	0	4	3
10.	U18ESEE1L3	ES	Basic Electrical and Electronics Engineering Practices Laboratory	3	0	0	3	1.5
			Total	33	18	0	15	22.5
ACTIVITY BASED COURSES								
11..	U18MCAB101	MC	Physical health – Sports & Games	2	0	0	2	0
12..	U18MCAB102	MC	Gardening & Tree Plantation -	2	0	0	2	0

***Laboratory Classes will be conducted on alternative weeks for Physics and Chemistry. The Lab Practical Examinations will be held only in the second semester (including the first semester experiments).**

SEMESTER II								
Sl.No	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1.	U18HSEN201	HS	Technical English	2	1	1	0	2
2.	U18BSMA201	BS	Engineering Mathematics II	4	4	0	0	4
3.	U18BSPH202	BS	Semi-Conductor Physics	3	3	0	0	3
4.	U18BSCH201	MC	Environmental Sciences	3	3	0	0	3
5.	U18ESCS101	ES	Problem Solving and Python Programming	3	3	0	0	3
6.	U18ESME101	ES	Engineering Graphics & Design	5	1	0	4	3
PRACTICAL								
7.	*U18BSPH2L2	BS	Wave Optics and Semi-Conductor Physics Lab	3	0	0	3	1.5
8.	*U18BSCH2L4	BS	Chemistry Lab	3	0	0	3	1.5
9.	U18ESCS1L1	ES	Problem Solving and Python Programming Lab	3	0	0	3	1.5
			Total	29	15	1	13	22.5
ACTIVITY BASED COURSES								
10.	U18MCAB203	MC	Yoga	2	0	0	2	0
11.	U18MCAB204	MC	Physical health – NCC	2	0	0	2	0

***Laboratory Classes will be conducted on alternative weeks for Physics and Chemistry. The Lab Practical Examinations will be held only in the second semester (including the first semester experiments).**

SEMESTER III								
S.No	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1.	U18BSMA301	BS	Partial Differential Equation and Transformation	4	3	1	0	4
2.	U18PCEE301	PC	Electrical Circuit Analysis	4	3	1	0	4
3.	U18PCEE302	PC	Analog Electronic Circuits	3	3	0	0	3
4.	U18PCEE303	PC	Electrical Machines – I	3	3	0	0	3
5.	U18PCEE304	PC	Electromagnetic Fields	4	3	1	0	4
PRACTICAL								
6.	U18PCEE3L1	PC	Analog Electronic circuits Laboratory	3	0	0	3	1.5
7.	U18PCEE3L2	PC	Electrical Machines-1 Laboratory	3	0	0	3	1.5
			Total	24	15	3	6	21
ACTIVITY BASED COURSES								
8.	U18MCAB305	MC	Culture- Learning an art form	2	0	0	2	0
9.	U18MCAB306	MC	Culture – Intangible Cultural, heritage(Festivals, Food ways, Local games)	2	0	0	2	0

SEMESTER IV								
Sl.No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1.	U18PCEE401	PC	Digital Electronics	3	3	0	0	3
2.	U18PCEE402	PC	Electrical Machines – II	4	3	1	0	4
3.	U18PCEE403	PC	Power Electronics	3	3	0	0	3
4.	U18PCEE404	PC	Digital Signal Processing	4	3	1	0	4
5.	U18BSMA402	BS	Probability, Statistics & Numerical Methods	4	3	1	0	4
6.	U18HSBA401	HS	Organizational Behavior	3	3	0	0	3
7.	U18MCTH502	MC	Universal Human Values	2	2	0	0	0
PRACTICAL								
8.	U18PCEE4L1	PC	Digital Electronics Laboratory	3	0	0	3	1.5
9.	U18PCEE4L2	PC	Electrical Machines - II Laboratory	3	0	0	3	1.5
10.	U18PCEE4L3	PC	Power Electronics Laboratory	3	0	0	3	1.5

Total				32	20	3	9	25.5
ACTIVITY BASED COURSES								
11.	U18MCAB407	MC	Literature & Media – Literature, Cinema & Media	2	0	0	2	0
12.	U18MCAB408	MC	Literature & Media – Group Reading of Classics	2	0	0	2	0

SEMESTER V								
Sl.No	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1.	U18PCEE501	PC	Power Systems – I (Apparatus and Modelling)	3	3	0	0	3
2.	U18PCEE502	PC	Control Systems	4	3	1	0	4
3.	U18PCEE503	PC	Electrical Machine Design	4	3	1	0	4
4.	U18PCEE504	PC	Measurements and Instrumentation	3	3	0	0	3
5.		OE	Open Elective-1	3	3	0	0	3
6.	U18MCTH401	MC	Constitution of India	2	2	0	0	0
PRACTICAL								
7.	U18PCEE5L1	PC	Power Systems Laboratory - I	3	0	0	3	1.5
8.	U18PCEE5L2	PC	Control Systems Laboratory	3	0	0	3	1.5
9.	U18PCEE5L3	PC	Measurements and Instrumentation Laboratory	3	0	0	3	1.5
			Total	28	17	2	9	21.5
ACTIVITY BASED COURSES								
10.	U18MCAB509	MC	Social Services – Social Awareness	2	0	0	2	0
11.	U18MCAB510	MC	Social Services – NSS	2	0	0	2	0

SEMESTER VI								
Sl.No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1.	U18PCEE601	PC	Power Systems – II (Operation and Control)	3	3	0	0	3
2.	U18PCEE602	PC	Microprocessor & Microcontroller	3	3	0	0	3
3.	U18PCEE603	PC	Fuzzy Logic & Neural Networks	3	3	0	0	3

4.		PE	Program Elective - 1	3	3	0	0	3
5.		OE	Open Elective-2	3	3	0	0	3
PRACTICAL								
6.	U18PCEE6L1	PC	Power Systems Laboratory - II	3	0	0	3	1.5
7.	U18PCEE6L2	PC	Microprocessors & Microcontrollers Laboratory	3	0	0	3	1.5
8.	U18EEEE 6L3	EE	Technical Seminar	2	0	0	2	1
9.								
Total				23	15	0	8	19
ACTIVITY BASED COURSES								
11.	U18MCAB611	MC	Self-Development – Spiritual, Mindfulness & Meditation	2	0	0	2	0
12.	U18MCAB612	MC	Self-Development - religion and Inter-faith	2	0	0	2	0

SEMESTER VII								
Sl.No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1.	U18PCEE701	PC	Smart Grid	3	3	0	0	3
2.		PE	Program Elective - 2	3	3	0	0	3
3.		PE	Program Elective - 3	3	3	0	0	3
4.		PE	Program Elective - 4	3	3	0	0	3
5.		OE	Open Elective-3	3	3	0	0	3
6.	U18MCTH603	MC	Essence of Indian Knowledge Tradition	2	2	0	0	0
PRACTICAL								
7.	U18PREE7P1	EE	Project Stage-I	6	0	0	6	3
8.	U18PCEE7L1	PC	Electronics Design Lab	4	0	0	4	2
9.	U18EEEE7L2	EE	Summer Internship					1
Total				27	17	0	10	21
ACTIVITY BASED COURSES								
11.	U18MCAB713	MC	Behavioral and interpersonal skills	2	0	0	2	0
12.	U18MCAB714	MC	Nature – Nature club	2	0	0	2	0

SEMESTER VIII								
Sl.No	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1.		MO	Open Elective -4 MOOC	2	2	0	0	2
2.		PE	Program Elective -5	3	3	0	0	3
3.		PE	Program Elective -6	3	3	0	0	3
PRACTICAL								
4.	U18PREE8P1	EE	Project Stage-II	18	0	0	18	9

			Total	26	8	0	18	17
ACTIVITY BASED COURSES								
5.	U18MCAB815	MC	Innovation – Project based – Sc., Tech, Social, Design & Innovation	2	0	0	2	0

PROFESSIONAL ELECTIVE –1(Semester VI)								
Sl.No	**Code No.**	**Specialization**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
1.	U18PEEE11	Power system	Power system Protections	3	3	0	0	3
2.	U18PEEE12	Power Electronics & Drives	Line Commutated and Active PWM Rectifiers	3	3	0	0	3
3.	U18PEEE13	Energy Systems &management	Utilization Of Electrical Energy	3	3	0	0	3
4.	U18PEEE14	Controls & Automation	Special Electrical Machines & Controllers	3	3	0	0	3

PROFESSIONAL ELECTIVE – 2(Semester VII)								
Sl.No	**Code No.**	**Specialization**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
1.	U18PEEE21	Power system	HVDC Transmission Systems	3	3	0	0	3
2.	U18PEEE22	Power Electronics & Drives	Solid State DC Drives	3	3	0	0	3
3.	U18PEEE23	Energy Systems &management	Distributed generation and Micro grid.	3	3	0	0	3
4.	U18PEEE24	Controls & Automation	Micro Controller Based System Design	3	3	0	0	3

PROFESSIONAL ELECTIVE - 3(Semester VII)								
Sl.No	**Code No.**	**Specialization**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
1.	U18PEEE31	Power system	High Voltage Engineering	3	3	0	0	3
2.	U18PEEE32	Power Electronics & Drives	Solid State AC Drives	3	3	0	0	3
3.	U18PEEE33	Energy Systems &management	Energy Management Systems and SCADA	3	3	0	0	3

4.	U18PEEE34	Controls & Automation	Bio-Medical Instrumentation	3	3	0	0	3

PROFESSIONAL ELECTIVE – 4(Semester VII)								
Sl.No.	**Code No.**	**Specialization**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
1.	U18PEEE41	Power system	Power Quality	3	3	0	0	3
2.	U18PEEE42	Power Electronics & Drives	Solid State Relays	3	3	0	0	3
3.	U18PEEE43	Energy Systems &management	Renewable Energy Sources	3	3	0	0	3
4.	U18PEEE44	Controls & Automation	Industrial Electrical system & Automation	3	3	0	0	3

PROFESSIONAL ELECTIVE – 5(Semester VIII)								
Sl.No	**Code No.**	**Specialization**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
1.	U18PEEE51	Power system	Power System Dynamics and Control	3	3	0	0	3
2.	U18PEEE52	Power Electronics & Drives	Power Converter Analysis and Design	3	3	0	0	3
3.	U18PEEE53	Energy Systems &management	Electric Power Distribution System	3	3	0	0	3
4.	U18PEEE54	Controls & Automation	Instrumentation & Controls in Power Plant Industry	3	3	0	0	3

PROFESSIONAL ELECTIVE – 6(Semester VIII)								
Sl.No	**Code No.**	**Specialization**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
1.	U18PEEE61	Power System	Flexible AC Transmission Systems	3	3	0	0	3
2.	U18PEEE62	Power Electronics & Drives	Power electronics application to renewable energy system	3	3	0	0	3
3.	U18PEEE63	Energy Systems &management	Wind & Solar Energy Systems	3	3	0	0	3
4.	U18PEEE64	Controls & Automation	Robotics & Automation	3	3	0	0	3

OPEN ELECTIVES FROM EEE

OPEN ELECTIVE								
Sl.No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
1.	U18OEEE01	OE	Green Technologies	3	3	0	0	3
2.	U18OEEE02	OE	Electrical Safety and Quality Assurance	3	3	0	0	3
3.	U18OEEE03	OE	Energy Conservation Techniques	3	3	0	0	3
4.	U18OEEE04	OE	PLC and SCADA for Industrial Automation	3	3	0	0	3

LIST OF OPEN ELECTIVES COMMON TO ALL THE B.Tech PROGRAMMES

ALL THE OPEN ELECTIVES COURSES HAVE L=3, T=0, P=0 & C=3

1. U18OEBA001 Sociology
2. U18OEBA002-Lean Six Sigma
3. U18OEBA003-Cyber Law and Ethics
4. U18OEBA004-Economic Policies in India
5. U18OEBA005-Management Information System
6. Total Engineering Quality Management
7. U18OEBA007-Industrial Psychology
8. U18OEBA008-Entrepreneurship Development and IPR
9. U18OEBA009-Intellectual Property Rights
10. U18OEBA010-Engineering Economics and Cost Analysis
11. U18OEEN001- Soft Skills and Interpersonal Communication
12. U18OEEN002-Indian Writing in English
13. U18OEEN003-Creative Writing
14. U18OEEN004- Proficiency in English and Accent Training
15. U18OEMA001-Cryptography
16. U18OEMA002-Finite Automata Theory / Formal Languages
17. U18OEMA003-Linear Programming
18. U18OECE001 - Metro Systems and Engineering
19. U18OECE002-Pollution Regulations
20. U18OECE003-Road Safety
21. U18OECE004- Infrastructure Development
22. U18OECE005- Project Safety Management

23. U18OECE006- Environment, Health and Safety in Industries
24. U18OEME001-Design for Manufacturing and Assembly
25. U18OEME002Industrial Safety
26. U18OEME003-Refrigeration and Cryogenics
27. U18OEME004- Product Design and Development
28. U18OEAU001-Electric and Hybrid Vehicles
29. U18OEAU002-Intelligent Transportation System
30. U18OEAU003-Vibration and Noise Control
31. U18OEAU004-Automotive Sensors and Applications
32. U18OEMT001-MEMS and Nano Technology
33.U18OEMT002-Non-Destructive Testing
34. U18OEMT003-Bio Mechatronics
35.U18OEMT004-Artificial Intelligence for Robotics
36.U18OEAE001-Industrial Aerodynamics
37. U18OEAE002- Elements of Aeronautics and Astronautics
38. U18OEAE003- Unmanned Aerial Vehicle
39. U18OEAE004- Introduction to Avionics
40. U18OEAE005-Rocket Propulsion
41. U18OEEE001-Green Technologies
42. U18OEEE002-Electrical Safety and Quality Assurance
43.U18OEEE003-Energy Conservation Techniques
44.U18OEEE004-PLC and SCADA for Industrial
45.U18OEEC-001-Communication Systems
46. U18OEEC-002-VLSI circuits
47. U18OEEC-003-Image Processing Techniques
48.U18OEEC-004-Communication Networks
49. U18OEEC-005-An Introduction to DSP
50. U18OEEC-006-Basics of IoT
51. U18OEBM001-Medical Radiation Safety Engineering
52. U18OEBM002-Medical Waste Management
53. U18OEBM003-Quality Control in Healthcare
54. U18OEBM004-Wearable Technology
55.U18OEEI001-Analytical Methods and Instrumentation
56.U18OEEI002-Introduction to process Data Analytics
57.U18OEEI003-Reliability and Safety in Process industries
58.U18OEEI004-Multi sensor data fusion

59. U18OEBT001- Bioprocess Economics & Plant Design

60. U18OEBT002-Brewing technology

61. U18OEBT003-Biomining

62. U18OEBT004-Industrial Safety Engineering

63. U18OEAC001-Geo- informatics for Precision Farming

64. U18OEAC002-Livestock and poultry management

65. U18OEAC003-Extension methodologies and transfer of Agricultural Technologies

HUMANITIES AND SOCIAL STUDIES INCLUDING MANAGEMENT COURSES (HS)

Sl.No.	Code No.	Category	Course Title	Contact Periods	L	T	P	C
THEORY								
1.	U18HSEN101	HS	Communicative English	4	2	0	2	3
2.	U18HSEN201	HS	Technical English	2	1	1	0	2
3.	U18HSBA401	HS	Organizational Behavior	3	3	0	0	3
Total Credits								8

BASIC SCIENCE COURSES (BS)

Sl.No.	Code No.	Course Title	Contact Periods	L	T	P	C
1	U18BSMA101	Engineering Mathematics - I	4	4	0	0	4
2	U18BSPH101	Waves and Optics	3	3	0	0	3
3	U18BSCH101	Engineering Chemistry	3	3	0	0	3
4	U18BSMA201	Engineering Mathematics II	4	4	0	0	4
5	U18BSPH202	Semi Conductor Physics	3	3	0	0	3
6	U18BSCH201	Environmental Sciences	3	3	0	0	3
7	U18BSMA301	Partial Differential Equation and Transformation	4	3	1	0	4
8	U18BSMA402	Probability, Statistics & Numerical Methods	4	3	1	0	4
9	U18BSPH2L2	Wave Optics and Semi Conductor Physics Lab	3	0	0	3	1.5
10	U18BSCH2L4	Chemistry Lab	3	0	0	3	1.5
Total Credits							28

ENGINEERING SCIENCE COURSES (ES)

Sl.No	Code No.	Category	Course Title	Contact Periods	L	T	P	C
THEORY								
1.	U18ESEE101	ES	Basic Electrical & Electronics Engineering	3	3	0	0	3
2.	U18ESME101	ES	Engineering Graphics & Design	5	1	0	4	3
3.	U18ESCS101	ES	Programming for Problem Solving	3	3	0	0	3
PRACTICAL								
4.	U18ESME1L2	ES	Workshop/Manufacturing Practices Laboratory	5	1	0	4	3
5.	U18ESEE1L3	ES	Basic Electrical & Electronics Engineering Laboratory	3	0	0	3	1.5
Total Credits								13.5

PROFESSIONAL CORE COURSES

Sl.No.	Code No.	Category	Course Title	Contact Periods	L	T	P	C
THEORY								
1.	U18PCEE301	PC	Electrical Circuit Analysis	4	3	1	0	4
2.	U18PCEE302	PC	Analog Electronic Circuits	3	3	0	0	3
3.	U18PCEE303	PC	Electrical Machines – I	3	3	0	0	3
4.	U18PCEE304	PC	Electromagnetic Fields	4	3	1	0	4
5.	U18PCEE401	PC	Digital Electronics	3	3	0	0	3
6.	U18PCEE402	PC	Electrical Machines – II	4	3	1	0	4
7.	U18PCEE403	PC	Power Electronics	3	3	0	0	3
8.	U18PCEE404	PC	Digital Signal Processing	4	3	1	0	4
9.	U18PCEE501	PC	Power Systems – I (Apparatus and Modelling)	3	3	0	0	3
10.	U18PCEE502	PC	Control Systems	4	3	1	0	4
11.	U18PCEE503	PC	Electrical Machine Design	4	3	1	0	4
12.	U18PCEE504	PC	Measurements and Instrumentation	3	3	0	0	3

13.	U18PCEE601	PC	Power Systems – II (Operation and Control)	3	3	0	0	3
14.	U18PCEE602	PC	Microprocessor & Microcontroller	3	3	0	0	3
15.	U18PCEE603	PC	Fuzzy Logic & Neural Networks	3	3	0	0	3
16.	U18PCEE701	PC	Smart Grid	3	3	0	0	3
PRACTICALS								
17.	U18PCEE3L1	PC	Analog Electronic circuits Laboratory	3	0	0	3	1.5
18.	U18PCEE3L2	PC	Electrical Machines-1 Laboratory	3	0	0	3	1.5
19.	U18PCEE4L1	PC	Digital Electronics Laboratory	3	0	0	3	1.5
20.	U18PCEE4L2	PC	Electrical Machines - II Laboratory	3	0	0	3	1.5
21.	U18PCEE4L3	PC	Power Electronics Laboratory	3	0	0	3	1.5
22.	U18PCEE5L1	PC	Power Systems Laboratory - I	3	0	0	3	1.5
23.	U18PCEE5L2	PC	Control Systems Laboratory	3	0	0	3	1.5
24.	U18PCEE5L3	PC	Measurements and Instrumentation Laboratory	3	0	0	3	1.5
25.	U18PCEE6L1	PC	Power Systems Laboratory - II	3	0	0	3	1.5
26.	U18PCEE6L2	PC	Microprocessors &Microcontrollers Laboratory	3	0	0	3	1.5
27.	U18PCEE7L1	PC	Electronics Design Lab	4	0	0	4	2
Total Credits								71

EMPLOYABILITY ENHANCEMENT COURSES

Sl. No.	Code No.	Course Title	Contact Periods	L	T	P	C
1	U18EEEE 6L3	Technical Seminar	2	0	0	2	1
2	U18EEEE6L4	Internship					1
3	U18PREE7P1	Project Stage-I	6	0	0	6	3
4	U18PREE8P2	Project Stage-II	18	0	0	18	9
Total Credits							14

MANDATORY COURSES (MC)

Sl.No	Code No.	Category	Course Title	Contact Periods	L	T	P	C
THEORY								
1.	U18MCTH401	MC	Constitution of India	2	2	0	0	0
2.	U18MCTH502	MC	Universal Human Values	2	2	0	0	0
3.	U18MCTH603	MC	Essence of Indian Knowledge Tradition	2	2	0	0	0
4.	U18MCAB101	MC	Physical health – Sports & Games	2	0	0	2	0
5.	U18MCAB102	MC	Gardening & Tree Plantation -	2	0	0	2	0
6.	U18MCAB203	MC	Yoga	2	0	0	2	0
7.	U18MCAB204	MC	Physical health – NCC	2	0	0	2	0
8.	U18MCAB305	MC	Culture- Learning an art form	2	0	0	2	0
9.	U18MCAB306	MC	Culture – Intangible Cultural, heritage(festivals, Food ways, Local games)	2	0	0	2	0
10.	U18MCAB407	MC	Literature & Media – Literature, Cinema & Media	2	0	0	2	0
11.	U18MCAB408	MC	Literature & Media – Group Reading of Classics	2	0	0	2	0
12.	U18MCAB509	MC	Social Services – Social Awareness	2	0	0	2	0
13.	U18MCAB510	MC	Social Services – NSS	2	0	0	2	0
14.	U18MCAB611	MC	Self-Development – Spiritual, Mindfulness & Meditation	2	0	0	2	0
15.	U18MCAB612	MC	Self-Development -	2	0	0	2	0

			religion and Inter-faith					
16.	U18MCAB713	MC	Behavioral and interpersonal skills	2	0	0	2	0
17.	U18MCAB714	MC	Nature – Nature club	2	0	0	2	0
18.	U18MCAB815	MC	Innovation – Project based – Sc., Tech, Social, Design & Innovation	2	0	0	2	0
			Total Contact Hours	36				

SUMMARY OF CURRICULUM STRUCTURE AND CREDIT & CONTACT HOUR DISTRIBUTION

S. No	Sub Area	Credit As per Semester								No. of Credit	% of credit
		I	II	III	IV	V	VI	VII	VIII		
1	Humanities & Social Sciences including Management Ccourses (HS)	3	2		3					8	4.79
2	Maths&Basic Sciences (BS)	12	13	4	4					33	17.96
3	Engineering Sciences (ES)	7.5	7.5							15	8.98
4	Professional Core (PC)			17	18.5	18.5	12	5		71	42.51
5	Professional Electives (PE)						3	9	6	18	10.78
6	Open Electives (OE)					3	3	3		9	5.39
7	Massive Open Online Course(MOOC)								2	2	1.20
8	Employment Enhancement Courses (EE)						1	4	9	14	8.38
9	Mandatory courses(MC)									0	
	Total Credit	22.5	22.5	21	25.5	21.5	19	21	17	170	100.00
	Total Contact Hour	33	29	24	32	28	23	27	26		

SEMESTER – 1

U18HSEN101	Communicative English	L	T	P	C
	Total Contact Hours – 45	2	0	2	3
	Prerequisite course –NIL				
	Course Coordinator: Ms.A.S.Ragvi. Department:-English				

COURSE OBJECTIVES:- To emphasis and develop language skills to satisfy the needs of work environment. To inculcate reading and listening habits and thereby improvising speaking and writing skills.

COURSE OUTCOMES (COs)

CO1	R	Recall and list language skills for business related situations.
CO2	U	Understand and intensely focus on improving and increasing LSRW Skills
CO3	A	Apply a good command over basic writing technical report and reading skills.
CO4	An	Infer and use vocabulary in corporate work environment.
CO5	E	Examine Task- Based activity to enhance an effective communication
CO6	C	Actualize communication skills for employability

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PS O1
2	CO1	3			2			3		2				
	CO2	1			1			3		2				--
	CO3	1			2			3		2				
	CO4	1			1			3		3				
	CO5	1			2			3		2				
	CO6	1			1			3		3				

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/
			BS							
4	Approval									

UNIT I SPEAKING **6 hours**

Speaking- Pronunciation, Intonation, Stress and Rhythm -Common Everyday Situations:Conversations and Dialogues -Communication at Workplace -Interviews -Formal Presentations -introducing one self – exchanging personal information- narrating events, -incidents , speakingabout one's friend/pet -Wh- Questions- asking and answering-yes or no questions- parts ofspeech. Vocabulary development– prefixes- suffixes- articles, prepositions.

UNIT II READING 6 hours

Reading – comprehension (multiple choice questions, short questions) - short narratives and descriptions from newspapers including dialogues and conversations also used as short readingtexts-- and longer passages - understanding text structure- use of reference words and discoursemarkers-coherence-jumbled sentences vocabulary and structures- Vocabulary Building -The concept of Word Formation.

UNIT III LISTENING 6hours

Listening – listening to longer texts and filling in the table- product description- asking aboutroutine actions and expressing opinions. –Listening to telephonic conversations -degrees ofcomparison- pronouns- direct vs indirect questions- Vocabulary development – single wordsubstitutes- adverbs- Identifying Common Errors in Writing - Subject-verb agreement - Noun-pronoun agreement.

UNIT IV WRITING 6 hours

Writing- letter writing, formal and personal letters- after listening to dialogues or conversationsand completing exercises based on them. Understanding text structure- use of reference words anddiscourse markers-coherence-jumbled sentences -Tenses- simple present- simple past- presentcontinuous and past continuous- Vocabulary development- synonyms- antonyms- phrasal verbs-Articles - Prepositions.

UNIT V LANGUAGE DEVELOPMENT 6hours

Writing short essays – developing an outline- identifying main and subordinate ideas- dialoguewriting- listening to talks, conversations to complete the remaining, participating inconversations- short group conversations-Language development-modal verbs- present/ pastperfect tense.– paragraph writing- topic sentence- main ideas short narrative descriptions .Synonyms, antonyms, and standard abbreviations- Basic Writing Skills- Sentence Structures- Useof phrases and clauses in sentences - Importance of proper punctuation - Creating coherence-Organizing principles of paragraphs in documents- Techniques for writing precisely.

TEXT BOOKS

1. English A Course book for Under Graduate Engineers and Technologists. Orient Black Swan
Limited, Hyderabad: 2015
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCES

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
3. Dutt P. Kiranmai and RajeevanGeeta. Basic Communication Skills, Foundation Books: 2013
4. Means,L. Thomas and Elaine Langlois. English & Communication for Colleges.Cengage
Learning ,USA: 2007
5. Practical English Usage. Michael Swan. OUP. 2005.
6. Remedial English Grammar. F.T. Wood. Macmillan.2007
7. On Writing Well. William Zinsser. Harper Resource Book. 2001

CourseCoordinator HOD

SOFTSKILL LABORATORY

LIST OF EXPERIMENTS / EXCERCISES

1. Group discussion
2. Making effective presentations
3. Watching interviews &conversations
4. Reading different genres of texts
5. International English Language Testing System (IELTS)
6. Test of English as a Foreign Language (TOEFL)
7. Mock interviews
8. Time management &stress management
9. Role play
10. Listening to lectures, discussions from TV/ Radio.
11. Articulation of sounds- intonation.
12. Creative and critical thinking.

U18BSMA101	**Engineering Mathematics – I**	**L**	**T**	**P**	**C**
	Total Contact Hours – 60	3	1	0	4
	Prerequisite course –Nil				
	Course Coordinator: Mr. VivekKumaran. Department:-Mathematics				

COURSE OBJECTIVES:-The aim is to develop mathematical curiosity and use inductive and deductive reasoning when solving problems, and to develop the knowledge,skills and attitudes necessary to pursue further studies in Mathematics and tobecome confident in using Mathematics to analyze and solve problems in real – life situations.

COURSE OUTCOMES (COs)

CO1	R	To remember both the limit definition and rules of differentiatefunctions.
CO2	U	Understand the Theorem ant its application of analysis to Engineering problems. Also they will have a basic understanding of Beta and Gamafunctions.
CO3	A	To apply differential and integral calculus to notions of curvature. Also applydifferentiation to find maxima and minima of functions. To apply definite integrals of algebraic and trigonometric functions using formulas and substitution.
CO4	An	To analyze multiple integrals to compute area and volume over curves, surface anddomain in two dimensional and three dimensional spaces.
CO5	E	To examine Eigenvalue problems from practical areas using transformations;Diagonalising the matrix that would render the Eigen values.
CO6	C	To design differentiation and integration techniques to solve engineering problems

Mapping of Course Outcomes with Program outcomes (POs)
(1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PS O1
2	CO1	3				2		1			1			
	CO1	3			1					3				
	CO2	3			1					2				
	CO3	3			1					2				
	CO4	3			1					2				
	CO5 CO6	3 3			1 1					3 3				

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
			BS							
4	Approval									

UNIT I THEORY OF EQUATIONS (9+3) hours

Fundamental theory of algebra – number of roots of polynomial equations – conjugate pairs
theorem (without proof) – Descartes rules of signs- symmetric functions of the roots – formation
of equations – diminish the roots of an equations- Multiple roots – reciprocal equation.

UNIT II DIFFERENTIAL CALCULUS – One Variabl (9+3) hours

Representation of functions – limit of a function – continuity – Derivatives – Differentiation rule
– Maxima and minima of functions of one variable – Rolle's Theorem – Mean Value Theorem –
Taylor's and Maclaurin's Theorem with remainders

UNIT III DIFFERENTIAL CALCULUS - Several Variables (9+3) hours

Partial derivatives –Euler's theorem on Homogeneous functions - directional derivatives – total
derivative – Jacobian–Maxima and minima of two variables.

UNIT IV INTEGRAL CALCULUS - One Variables (9+3)hours

Definite integrals – Substitution rule – Techniques of integration – Integration by parts –
Trigonometric integrals – Trigonometric substitutions – Integrations of rational functions by
partial fractions – Integrations of irrational functions-Beta, Gamma functions and their properties.

UNIT V MATRICES (9+3)hours

Characteristic Equations –Eigenvalue and Eigenvectors of the real matrix– Properties–-Cayley-
Hamilton Theorem – Diagonalization of matrices – Reduction of quadratic form to canonical
form by orthogonal transformation – Nature of Quadratic form.

TEXT BOOKS

1. Grewal B. S, Higher Engineering Mathematics, Khanna Publisher, Delhi – 2014.
2. Kreyszig. E, Advanced Engineering Mathematics, 10 th edition, John Wiley & Sons, Singapore,
2012.

REFERENCE BOOKS

1. Veerarajan T, Engineering Mathematics, II edition, Tata McGraw Hill Publishers, 2008.
2. Kandasamy P &co., Engineering Mathematics, 9 th edition, S. Chand & co Pub., 2010.
3. N.P.Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,
Reprint, 2010.
4. George B. Thomas ,Jr ,Maurice D.Weir, Joel Hass., Thomas' Calculus ,Twelfth EditionAddison-Wesley, Pearson.
5. Narayanan S., ManickavachagamPillai T.K., Ramanaiah G., Advanced Mathematics for
Engineering students, Volume I (2 nd edition), S.Viswanathan Printers and Publishers, 1992.

CourseCoordinator HOD

U18BSPH101	**Waves and Optics**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	3	0	0		3
	Prerequisite course -Nil					
	Course Coordinator: Ms.Radhika. Department:-Physics					

COURSE OBJECTIVES:-To develop Physics and Engineering strategies of Waves and Optics and to discuss their functionalities in modern optoelectronics.

COURSE OUTCOMES (COs)

CO1	R	Recall the basic concept of waves and lights
CO2	U	Understand the importance of Ultrasonic waves and Non-Destructive Testing
CO3	A	Apply the propagation of light and geometrical optics
CO4	An	Analyze the optical phenomenon like interference, diffraction and superposition of waves
CO5	E	Evaluate the operation of laser and its applications
CO6	C	Design applications of lasers in science, engineering and medicine.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PS O1	PS O2
2	CO1	3			3					3					
	CO2	1			2					3					
	CO3	3								2					
	CO4	3								2					
	CO5	3			2					3					
	CO6	3			2					3					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
			BS							
4	Approval									

UNIT 1 NON-DISPERSIVE TRANSVERSE AND LONGITUDINAL WAVES IN ONE

DIMENSION **9 hours**

Introduction - Transverse wave on a string, the wave equation on a string, Harmonic waves,reflection and transmission of waves at a boundary, standing waves, longitudinal waves and the

wave equation for them, acoustics waves and speed of sound. Waves with dispersion,superposition of waves, wave groups and group velocity.

UNIT 2 ULTRASONIC WAVES **9 hours**

Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating–Detection - Non Destructive Testing – pulse echo system through transmission and reflection

modes - A,B and C – scan displays, Industrial and Medical applications – Sonogram.

UNIT 3 THE PROPAGATION OF LIGHT AND GEOMETRIC OPTICS 9 hours

Fermat's principle of stationary time and its applications e.g. in explaining mirage effect, laws of

reflection and refraction, Light as an electromagnetic wave and Fresnel equations, reflectance and

transmittance, Brewster's angle, total internal reflection, and evanescent wave. Mirrors and lenses

and optical instruments based on them.

UNIT 4 WAVES OPTICS **9 hours**

Huygens' principle, superposition of waves and interference of light by wavefront splitting and

amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer.

Fraunhofer diffraction from a single slit and a circular aperture, Diffraction gratings and their

resolving power.

UNIT 5 LASERS **9 hours**

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light

by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-statelasers(Neodymium), Properties of laser beams: mono-chromaticity, coherence, directionality and

brightness, applications of lasers in science, engineering and medicine.

TEXT BOOKS

1. M.N. Avadhanulu and P.G. Kshirsagar, "A Textbook of Engineering Physics" S.Chand Publishers, 2016 (for Units 1,3,4& 5)
2. G.Senthil Kumar, "Engineering Physics", VRB publishers, Chennai, 2015 (for Unit 2)

REFERENCE BOOKS

1. BrijLal and Subramanian, "Waves and Oscillation", VikasPublishsing House, 2011
2. R.Murugesan,"Optics and Spectroscopy", S.Chand Publishers, 2015
3. BrijLal and Subramanian,"Optics", S.Chand Publishers 2006
4. Ian G. Main, "Vibration and waves in physics", Cambridge University Press, 1978
5. H.J. Pain, "The physics of vibrations and waves", 6th edition, Wiley 2006
6. AjoyGhatak, "Optics", Tata McGraw-Hill publishing company, New Delhi, 2009
7. O. Svelto, "Principles of Lasers", Springer, 2010
8. Online reference Wikipedia.org.

CourseCoordinator HOD

U18BSCH101	**Engineering Chemistry**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	3	0	0		3
	Prerequisite course –Nil					
	Course Coordinator: Dr.P.Mahesn. Department:-Chemistry					

COURSE OBJECTIVES:-To gain fundamental knowledge of Engineering Chemistry and its applications

COURSE OUTCOMES (COs)

CO1	R	To remember the principles of Conventional and non-conventional energy sources and energy storage devices
CO2	U	To understandthe principles, water characterization,conversant with boiler feed water requirements and water treatment techniques.
CO3	A	. To apply industrial importance of Phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys
CO4	An	To analyze the Chemistry of Fuels and calorificvalue, manufacture of solid, liquid and gaseous fuels.
CO5	E	To evaluate the Nanochemistry, Types of nanomaterials:Nanoparticles,Nanochemistry in biology and medicines.
CO6	C	To design industrial application using conventional and non-conventional energy sources and energy storage devices

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 3	2	3	4	5	6	7	8	9	10	11	12	PS O	PS O
2	CO1	3			1					3					
	CO2	3			1					2					
	CO3	3			1					2					
	CO4	3			1					3					
	CO5	3			1					3					
	CO6	3			1					3					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
			BS							
4	Approval									

UNIT I WATER TECHNOLOGY 9hours

Introduction - Characteristics: Hardness of Water – Types - Temporary and Permanent Hardness -Estimation by EDTA method. Alkalinity – Types of Alkalinity - Phenolphthalein and MethylOrange Alkalinity - Determination – Domestic Water Treatment – Disinfection methods(Chlorination, Ozonation, and UV Treatment). Boiler feed water – Requirements – Disadvantagesof using hard water in boilers (Caustic embrittlement, Boiler corrosion, Priming and foaming) –Prevention of scale formation – softening of hard water - Internal treatment (Calgon treatmentmethod) – External treatment – Demineralization process – Desalination and Reverse osmosis.

UNIT II PHASE RULE AND ALLOYS 9 hours

Introduction: Statement of Phase Rule and Explanation of terms involved – One componentsystem – Water system – Construction of phase diagram by thermal analysis - Condensed phaserule - Two Component System : Simple eutectic systems (lead-silver system) – eutectictemperature – eutectic composition – Pattinson's Process of desilverisation of Lead.Alloys: Importance, ferrous alloys – nichrome and stainless steel – 18/8 stainless steel – heattreatment of steel – annealing –hardening – tempering - normalizing – carburizing - nitriding.Non- ferrous alloys: Brass and Bronze.

UNIT III NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES 9hours

Introduction: Nuclear fission and nuclear fusion reactions – differences between nuclear fission and nuclear fusion reactions – nuclear chain reactions – nuclear energy critical mass – super critical mass - sub - critical mass Light water nuclear reactor for Power generation – breeder reactor. Solar energy conversion – solar cells – wind energy. Fuel cells – hydrogen – oxygen fuel cell. Batteries: Primary and secondary Batteries – differences between Primary and secondary Batteries Secondary batteries: Lead–acid storage battery –working –uses. Nickel–cadmium battery -working –uses. Solid – state battery: Lithium battery.

UNIT IV FUELS 9hours

Introduction: Calorific value – types of Calorific value - gross calorific value – net calorific value. Analysis of Coal – Proximate and ultimate analysis – hydrogenation of coal - Metallurgical coke –manufacture by Otto-Hoffmann method. Petroleum processing and fractions– cracking – catalytic cracking – types – fixed bed catalytic cracking method- Octane number and Cetane number. Synthetic petrol – Bergius processes – Gaseous fuels- water gas, producer gas,CNG and LPG. Flue gas analysis – importance - Orsat apparatus.

UNIT V NANOCHEMISTRY 9hours

Introduction: Nanochemistry: Definition - Classification based on dimensions - Size dependent properties. Types of nanomaterials: Nanoparticles: Synthesis by Bottom-up and top-down approaches - Nanoporous materials: Synthesis by sol-gel method. Nanowires: Synthesis by VLS mechanism. Carbon Nanotubes (CNTs): Single walled and Multi walled nanotubes – Mechanical and electrical properties of CNTs - Applications of CNTs - Synthesis of CNTs by Electric arc discharge method and Laser ablation method. Nanochemistry in biology and medicines – nanocatalysis.Nano composites – sensors and electronic devices.

TEXT BOOKS

1. P.C.Jain and Monica Jain, “Engineering Chemistry” DhanpatRai Pub, Co., New Delhi (2002).
2. S.S.Dara “A text book of Engineering Chemistry” S.Chand&Co.Ltd., New Delhi (2006).
3. P. J. Lucia, M. Subhashini, “Engineering Chemistry, Volume 1”, Crystal Publications, Chennai, (2007).
4. S. Vairam, P. Kalyani and Suba Ramesh, ―Engineering Chemistry‖, Wiley India PVT, LTD, New Delhi, 2013.
5. G. B. Sergeev, Nano chemistry, Elsevier Science, New York, 2006.

REFERENCES BOOKS

1. B.K.Sharma “Engineering Chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).

CourseCoordinator HOD

U18ESEE101	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	L	T	P		C
	Total Contact Hours – 45	3	0	0		3
	Prerequisite course –Nil					
	Course Coordinator:Ms.Venkateswari. Department:-EEE					

COURSE OBJECTIVES:-To gain fundamental knowledge of Electrical and Electronics Engineering and its applications

COURSE OUTCOMES (COs)

CO1	R	To remember laws and theorems associated with DC ,AC circuits and machines.
CO2	U	To understand the principle of operation od AC & AC Machines & Transformers and semiconductors Devices & Digital systems
CO3	A	To apply knowledge to electrical machines, transformers and semiconductors Devices & Digital systems
CO4	An	To analyse various types electrical circuits , semiconductor devices and small signal amplifiers.
CO5	E	To evaluate AC ,DC machines and transformers applied to distribution networks
CO6	C	To design applications of semiconductors Devices & Digital systems

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	3			2				3				2	
	CO2	3	1			2				3				2	
	CO3	3	2			2				3				2	
	CO4	3	1			2				3				2	
	CO5	3	1			2				3				2	
	CO6	3	3			2				3				2	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
				ES						
4	Approval									

UNIT 1 DC CIRCUITS 9 hours

Electrical circuit elements, voltage and current sources, Fundamentals Relationship of VI forRLC circuit, Ohms Law, Source Transformation ,Kirchoff current and voltage laws, analysis ofsimple circuits with dc excitation. Basics of Superposition, Thevenin and NortonTheorems,Maximum Power Transfer Theorem.

UNIT 2 AC CIRCUITS 9 hours

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power,reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting ofR, L, C, RL, RC, RLC combinations (series and parallel), resonance.Time-domain analysis offirst-order RL and RC circuits. Three-phase balanced circuits, voltage and current relations instar and delta connections.

UNIT 3 ELECTRICAL MACHINES & TRANSFORMERS 9 hours

Principles of operation and characteristics of; DC machines,Synchronous machines, three phaseand single phase induction motors. Transformers (single and three phase) regulation andefficiency,all day efficiency and auto-transformer .

UNIT 4 SEMICONDUCTOR DEVICES AND APPLICATIONS 9 hours

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Halfwave and Full wave Rectifiers – Voltage Regulation.Bipolar Junction Transistor – CB, CE, CCConfigurations and Characteristics – Elementary Treatment of Small Signal Amplifier and itsapplications, Introduction to OP-AMP.

UNIT 5 DIGITAL ELECTRONICS 6hours

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops –Registers and Counters – Fundamentals of A/D and D/A Conversion.

TEXT BOOKS

1. John Bird,,Electrical Circuit Theory & Technology,Taylor& Francis Ltd, 6 th , edition. 2017.
2. SmarajitGhosh, Fundamentals of Electrical and Electronics Engineering, Second Edition, PHI
Learning, 2007.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 10th Edition, 2011.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Pearson, 2nd Edition, 2015.
6. Millman and Halkias, “Integrated Electronics”, McGraw Higher Ed, 2nd Edition, 2011.
7. Vincent Del Toro, `Electrical Engineering Fundamental, Prentice Hall, 2nd Edition, 2015.
8. K.A.Krishnamurthy and M.R.Raghuveer, `Electrical and Electronics Engineering for Scientists', New Age International Pvt Ltd Publishers, 2011.

REFERENCES

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, Third Reprint,2016.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Higher Ed, 1st Edition, 2011.
3.JacobMillman and Christos C-Halkias,"Electronic Devices and Circuits", McGraw Higher Ed,
4th Edition, 2015.

CourseCoordinator HOD

U18BSBT101	**BIOLOGY FOR ENGINEERS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	2	0	0	2
	Prerequisite course –Nil				
	Course Coordinator: Ms.Poorni. Department:-Industrial Biotechnology				

COURSE OBJECTIVES:-To provide a basic understanding of the biological systems and its applications inthe industrial sector

COURSE OUTCOMES (COs)

CO1	U	To remember the basic concepts of the cell and its structure
CO2	U	To understand about biodiversity and its conservation
CO3	Ap	Applyfundamentals of genetics and the immune system
CO4	An	To analyze the applications of bio systems in environment, medical and agricultural sectors
CO5	E	To eveloateapplications of transgenics
CO6	C	To create an awareness about human diseases

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	1		1		2			1					
	CO2	3	1		2		3			2					
	CO3	2			1		2			1					
	CO4	3			1		1			1					
	CO5	3	3		1		1			2					
	CO6	3			1		1			1					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
			BS							
4	Approval									

UNIT I INTRODUCTION TO LIFE 6hours

Characteristics of living organisms-Basic classification-cell theory-structure of prokaryotic andeukaryotic cell- Introduction to biomolecules - general classification and important functions ofcarbohydrates-lipids-proteins-nucleic acids – vitamins

UNIT II BIODIVERSITY 6hours

Plant System: basic concepts of plant growth-nutrition-photosynthesis-Animal System:elementary study of digestive-respiratory-circulatory-excretory systems and their functions.Microbial System -types of microbes-economic importance and control of microbes.

UNIT III GENETICS AND IMMUNE SYSTEM 6hours

Evolution: theories of evolution- evidence of laws of inheritance-variation and speciation-nucleic acids as a genetic material-central dogma - immunity-antigens-antibody-immuneresponse.

UNIT IV HUMAN DISEASES 6hours

Definition- causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer,hypertension, AIDS and Hepatitis

UNIT V BIOLOGY AND ITS INDUSTRIAL APPLICATION 6hours

Transgenic plants and animals-stem cell and tissue engineering-bioreactors-biopharming-recombinant vaccines-cloning-bioremediation-biofertilizer-biocontrol- biosensors-biopolymers-bioenergy-biomaterials-iochips.

TEXT BOOKS

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications, 2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company,
2011.
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004

REFERENCE BOOKS

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
2. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
3. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012

CourseCoordinator HOD

U18BSPH2L2	**Wave optics and semiconductor Physics Laboratory**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	0	0	3		1.5
	Prerequisite course –Nil					
	Course Coordinator:Ms.Radhika. Department:-Physics					

COURSE OBJECTIVES:-To impart knowledge of Semiconductor practical Physics

COURSE OUTCOMES (COs)

CO1	R	To remember the fundamental concept of optics& waves
CO2	U	To Understand the concept of production of ultrasonic waves and optics
CO3	A	To relate to the functions of semiconductor and optic applications
CO4	An	To analyze the operations of semiconductor and optic applications
CO5	E	To evaluate optics& waves usages

CO6	C	To designsemiconductor and optic applications													
	Mapping of Course Outcomes with Program outcomes (Pos) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low														
1	Cos/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PS O	PS O
2	CO1	3	2	3						1	3	2	2		
	CO2	3	3	1						1	3	2	2		
	CO3	2	3	3						1	3				
	CO4	3	2	2						2	3				
	CO5	3	2	2						2	3	2	2		
	CO6	3	2	2						2	2	1	1		
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)		
				BS											
4	Approval														

Physics Lab experiments for Semester I & II

List of Experiments for Waves and Optics – Common for all branches

1) Ultrasonic Interferometer
2) Air-wedge Experiment
3) Particle size determination
4) Determination of acceptance angle
5) Determination of Laser Wavelength
6) Spectrometer – Determination of wavelength using grating

List of Experiments for Semiconductor Physics – Circuit branches

1) Determination of Band Gap
2) Zener diode characteristics
3) p-n junction diode Characteristics
3) Transistor Characteristics
5) V-I characteristics using LDR circuit
6) Carey Foster's Bridge

CourseCoordinator HOD

U18BSCH2L4	Chemistry Laboratory	L	T	P	C
	Total Contact Hours – 45	0	0	3	1.5
	Prerequisite course –Engineering Chemistry				
	Course Coordinator:Ms.Mdhubala. Department:-Chemistry				

COURSE OBJECTIVES:-To enhance the practical knowledge on Chemistry through Volumetric andcircuit experiments.

COURSE OUTCOMES (Cos)

CO1	R	Remember the concept of spectrophotometric method and water treatment
CO2	U	Understand basic principle of spectrophotometric method and water treatment
CO3	A	Students will learn Conductometric Titration of Strong Acid with Strong Base and andConductometric Precipitation titration.
CO4	An	Students will able to analyze – hardness, Alkalinity, Dissolved oxygen and to analyze Determination of Molecular weight of a polymer by Viscosity Average Method.
CO5	E	Predict pH measurements for Acid – alkali Titrations and rate of corrosion by weight loss method
CO6	C	Design applications for environment domain

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	2	2	2		3		3		1				
	CO2	1	3			2		3		2		1			
	CO3		1		2						2				
	CO4	3		2				2				3			
	CO5	3	3		1		2				3				
	CO6	3	3							3	2	2			

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
			BS							

4	Approval	

LIST OF EXPERIMENTS

1. Determination of Total Hardness, Temporary Hardness and Permanent hardness of Water by
EDTA method
2. Estimation of Alkalinity - Titrimetry
3. Estimation of Dissolved Oxygen
4. Estimation of Chlorides in Water by Argentometric Method (MOHR'S Method)

5. Estimation of Copper by EDTA method
6. Estimation of Iron in Water by Spectrophotometry
7. Conductometric Titration of Strong Acid with Strong Base
8 Determination of Molecular weight of a polymer by Viscosity Average Method
9. pH measurements for Acid - alkali Titrations
10 Determination of rate of corrosion by weight loss method.
11. Conductometric Precipitation titration
12. Determination of Water Crystallization

REFERENCES

1. R. Jeyalakshmi, "Practical Chemistry", Devi Publications 2014.
2. S.S. Dara, A text book on experiments and calculation Engg.

CourseCoordinator HOD

U18ESME1L2	**Workshop/Manufacturing Practices**	**L**	**T**	**P**		**C**
	Total Contact Hours – 75	1	0	4		3
	Prerequisite course –NIL					
	Course Coordinator:Mr.Saravana Kumar. Department:-Mechanical Engineering					

COURSE OBJECTIVES:-To educate the students on common manufacturing processes employed in Industries.

COURSE OUTCOMES (COs)

CO1	R	Students will gain knowledge of the different manufacturing processes.
CO2	U	Students will be able to fabricate components with their own hands.
CO3	A	Students will gain practical knowledge of the dimensional accuracies and dimensional tolerances.
CO4	An	To analyse the dimensional accuraciesand dimensional tolerances.
CO5	E	To evaluate different manufacturing processes.
CO6	C	Students will be able to produce small devices of their interest

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	2							2		3			
	CO2	3	2	3	2					2		3			
	CO3	3	2							2					
	CO4	3	2		1					2		3			
	CO5	3	3							2					
	CO6	3	3							2					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
				ES						
4	Approval									

SYLLABUS

Lectures & videos **(15 hours)**

Detailed contents

- Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3 lecture)
- CNC machining, Additive manufacturing (2 lecture)
- Fitting operations &power tools (2 lecture)
- Carpentry (2 lecture)
- Plastic moulding, glass cutting (2 lecture)
- Metal casting (2 lecture)
- Welding (arc welding & gas welding), brazing (2 lecture)

WORKSHOP PRACTICE

1. Machine shop (6 hours)
   a) Facing
   b) Turning
   c) Drilling Practice
2. Fitting shop (6 hours)
   a) Fitting Exercises–Preparation of square fitting
   b) Vee–fittingmodels.
3. Carpentry (9 hours)
   a) Preparation Lap joints.
   b) Mortise and Tenonjoints.
   c) Cross Half.
   d) Dove Tail.
4. Welding shop (Arc welding 6 hrs + gas welding 3 hrs) (9 hours)
   Preparation of butt joints, lap joints and tee joints
5. Sheet Metal working (9 hours)
   a) Forming &Bending:
   b) Model making–Trays, funnels, etc.
   c) Different type of joints
6. Demonstration (6 Hours)
   Smithy operations, upsetting, swaging, setting down and bending.
   Example–Exercise–Production of hexagonal headed bolt.

Examinations could involve the actual fabrication of simple components, utilizing one or moreof the techniques covered above.

SUGGESTED TEXT/REFERENCE BOOKS

1. HajraChoudhury S.K., HajraChoudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers Private Limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",4th
edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4 th edition, Prentice Hall India,
1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

CourseCoordinator HOD

U18ESEE1L3	**Basic Electrical And Electronic Engineering Practices laboratory**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	0	0	3	1.5
	Prerequisite course -Nil				
	Course Coordinator: Ms.Sathyapriya. Department:-EEE				

COURSE OBJECTIVES:-To enhance the practical knowledge on basics of electrical and electronics Components and circuits.

COURSE OUTCOMES (COs)

CO1	R	To handle basic electrical equipment and verify current and voltage law
CO2	U	To understand the steady-state and transient time-response of R-L, R-C, and R-L-C circuits .
CO3	A	To produce domestic wiring procedures practically.
CO4	An	To analyze ac signal parameters using cathode ray oscilloscope andfunction generator
CO5	E	To discriminate l concepts semiconductor Diodeand Transistor
CO6	C	To design logic Gates and Flip-Flaps and applications of operational amplifier

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PS O	PS O
2	CO1	3	3			3				3		2			
	CO2	3	3			3				3		2			
	CO3	3	3			3				3		2			
	CO4	3	3			3				3		2			
	CO5	3	3			3				3		2			
	CO6	3	3			3				3		2			

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
				ES						
4	Approval									

LIST OF EXPERIMENTS FOR BASIC ELECTRICAL ENGINEERING LAB

1. Verification of Ohms and Kirchhoff's Voltage and Current Laws
2. Measurement of the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to
step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification.
3. Fluorescent lamp wiring
4. Staircase wiring
5. Measurement of energy using single phase energy meter
6. Observation of the no-load current waveform on an oscilloscope and Measurement of Primary
and secondary voltages and currents of a Transformer
7. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement),
induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring
arrangement) and single-phase induction machine.
8. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

LIST OF EXPERIMENTS FOR BASIC ELECTRONICS ENGINEERING LAB

1. Measurement of ac signal parameters using cathode ray oscilloscope and function generator.
2. Characteristics – Half wave and Full wave Rectifiers
3. Characteristics – Common Base transistor configuration
4. Verification of truth tables of OR, AND, NOT, NAND, NOR gates and Flip-flops - JK and RS
5. Applications of Operational Amplifier.

CourseCoordinator HOD

SEMESTER – II

U18HSEN201	**Technical English**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	1	1	0		2
	Prerequisite course –Nil					
	Course Coordinator:Mr.Gopinath. Department:-English					

COURSE OBJECTIVES:-To gain fundamental knowledge of English language and its usage in day to day life.		
COURSE OUTCOMES (COs) On completion of the course, the students will be able to		
CO1	R	Recall language skills for business related situations.
CO2	U	Understand and intensely focus on improving and increasing LSRW Skills
CO3	A	Relate a good command over basic writing technical report and reading skills.
CO4	An	Analyze and use vocabulary in corporate work environment.
CO5	E	Evaluate Task- Based activity to enhance an effective communication
CO6	C	Plan communication skills for employability

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3			2			3		2					
	CO2	1			1			3		2					
	CO3	1			2			3		2					
	CO4	1			1			3		3					
	CO5	1			2			3		2					
	CO6	1			1			3		3					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
		HS								

4	Approval		

UNIT I LISTENIN 6 hours

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- Speaking –Asking for and giving directions- extended definitions – listening todaily issue- -Vocabulary Development- technical vocabulary - Language Development –subjectverb agreement – compound words.

UNIT II READING 6 hours

Reading – reading longer technical texts- identifying the various transitions in a text- interpretingcharts, graphs after reading the, practice in speed reading- vocabulary Development-vocabularyused in formal letters/emails and reports -Language Development personal passive voice,numerical adjectives.

UNIT III TECHNICAL WRITING 6 hours

Writing after listening to classroom lectures- talk should be on engineering /technology–introduction to technical presentations- longer texts both general and technical, Describing aprocess, use of sequence words- Vocabulary Development- sequence words- Misspelled words.

UNIT IV FORMAL WRITING 6 hours

Writing- email etiquette- job application – cover letter –Resume preparation (via email

and hardcopy)- analytical essays and issue based essays–Vocabulary Development- finding suitablesynonyms-paraphrasing-. Language Development- clauses- dependent, independent, ifconditionals.

UNIT V LANGUAGE DEVELOPMENT 6 hours

Speaking –participating in a group discussion – role play, Writing– Writing reports- minutes of ameeting- accident and survey-Vocabulary Development- transitive, intransitive verbs, LanguageDevelopment- reported speech.

TEXT BOOKS

1. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

REFERENCES

1. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
2. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges CengageLearning, USA: 2007.

CourseCoordinator HOD

U18BSMA201	**Engineering Mathematics – II**	**L**	**T**	**P**		**C**
	Total Contact Hours – 60	3	1	0		4
	Prerequisite course –Engineering Mathematics 1					
	Course Coordinator:Ms.Pavi. Department:-Mathematics					

COURSE OBJECTIVES:-The objective of this course is to equip the students of Engineering andTechnology with techniques in ordinary equations, vector calculus, complexvariables and Laplace transform with advanced level of mathematics andapplications that would be essential to formulate problems in engineeringenvironment..

COURSE OUTCOMES (COs) On completion of the course, the students will be able to

CO1	R	.To remember the concept of differential equation, vector calculus and analytical functions
CO2	U	To understand the analytic functions, conformal mapping and complex integration andtheir applications.
CO3	A	To relatemathematical tools for solution of differential equation that model physicalprocess
CO4	An	To study the line, surface and volume integrals using Green's, Stoke's and GaussTheorems and their verification.
CO5	E	. To evaluate real and complex integrals using the Cauchy's integral formula and Residuetheorem.
CO6	C	To design an application of Laplace Transformation in analysis and solve differentialequations

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PS O	PS O
2	CO1	2				3				2		3			
	CO2	3				3				2		1			
	CO3	3				2				3		1			
	CO4	3				2				2		1			

	CO5	3				2				2		3			
	CO6	3				2				2		1			
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)			Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)		
				BS											
4	Approval														

UNIT I ORDINARY DIFFERENTIAL EQUATIONS (9+3) hours

Higher order linear differential equations with constant coefficients – linear differential equationswith variable coefficients– Euler's and Legendre's linear equations – Simultaneous first orderlinear equations with constant coefficients- Method of variation of parameters.

UNIT II VECTOR CALCULUS (9+3) hours

Scalar and vector point function - Gradient, Divergence and curl – Directional derivatives – Anglebetween two surfaces - Irrotational and Solenoidal vector fields – Line Integral - Green's theorem– Gauss divergence theorem and Stokes' theorem – Simple applications involving cubes andrectangular parallelepipeds.

UNIT III ANALYTIC FUNCTIONS (9+3)hours

Functions of complex variable - Analytic functions – Necessary and sufficient conditions (withoutproof), Cauchy Riemann Equations in Cartesian and polar form – Harmonic functions – properties of analytic functions – Construction of analytic functions using Milne Thomsonmethod –Conformal mapping : and Bilinear Transformation.

UNIT IV COMPLEX INTEGRATION (9+3) hours

Cauchy integral theorem – Cauchy's integral formula – problems – Taylor's and Laurent's Series – classification of Singularities – Poles and Residues – method of finding residues - Cauchy's residue theorem and its applications to evaluate real integrals – contour integration.

UNIT V LAPLACE TRANSFORMS (9+3) hours

Transforms of elementary functions – Basic properties – Shifting theorem- Transforms ofderivatives and integrals – Initial and final value theorem – Laplace transform of PeriodicFunctions – Inverse Laplace transform – Convolution theorem – Periodic Functions – Applications of Laplace transform for solving linear ordinary differential equations up to secondorder with constant coefficient.

TEXT BOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9 th Edition, John Willie & Sons, 2006.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35 th Edition, 2000.

REFERENCE BOOKS

1. Venkataraman. M. K, Engineering Mathematics, National Publishing Company, 2000.
2. Bali .N.P and Manish Goyal, A Text book of Engineering Mathematics, Eighth Edition,Laxmi Publications Pvt Ltd., 2011.
3. Veerarajan T, Engineering Mathematics, II edition, Tata McGraw Hill Publishers, 2008.
4. George B. Thomas Jr., Maurice D. Weir, Joel R. Hass., Thomas' Calculus, 12 th Edition,Addison-Wesley, Pearson.

CourseCoordinator HOD

U18BSPH202	Semiconductor Physics	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite course –Nil				
	Course Coordinator:Mr.Seevagan. Department:-Physics				

COURSE OBJECTIVES:-To develop physics and engineering strategies of semiconductor materials and to discusstheir functionalities in modern electronic and optoelectronic devices

COURSE OUTCOMES (COs)

CO1	R	To define Electronic States Of Semiconductors and concepts
CO2	U	Understand the importance of doping to charge carrier density and difference between metals, semiconductors and insulators
CO3	A	To demonstrate the electrical transport in semiconductors
CO4	An	To discriminate the difference between direct and indirect semiconductors
CO5	E	Justification of electrical and optical transport techniques
CO6	C	Designing of semiconductor devices

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3				2				1					
	CO2	3				2				1					
	CO3	3				2				2					
	CO4	3				2				1					
	CO5	3				2				1					
	CO6	3				2				2					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
			BS							

4	Approval		

UNIT1 INTRODUCTION AND ELECTRONIC STATES OF SEMICONDUCTORS
9 hours

Introduction to solid state materials - crystal structure - Reciprocal lattice - Brillouin zone andrules for band (k - space) representation. Dynamics of electrons in periodic potential:Kronig - penny and nearly free electron models - Real methods for band structure calculations; Band gapsin semiconductors - Holes and effective mass concept - Properties of conduction and valancebands.

UNIT2 CARRIERS AND DOPING **9 hours**

Fermi distribution and energy - Density of states - Valance and conduction band density of states- intrinsic carrier concentration – intrinsic Fermi level. Extrinsic semiconductors: n and p typedoping - Densities of carriers in extrinsic semiconductors and their temperature dependence -

extrinsic semiconductor Fermi energy level - Degenerate and non - degenerate semiconductors - Band gap engineering

UNIT 3 ELECTRICAL TRANSPORT 9 hours

Scattering Mechanism: electron - electron and electron – phonon scattering. Macroscopictransport: Carrier transport by Diffusion - Carrier transport by Drift: Low field, High field andvery high field.

UNIT 4 OPTICAL TRANSPORT 9 hours

Electron - hole pair generation and recombination: band to band (direct and indirect band gaptransitions) and intra band (impurity related) transitions, free - carrier & phonon transitions.Excitons: Origin, electronic levels and properties. Carrier transport - continuity equations.Optical constants: Kramers - Kronig relations.

UNIT 5 SEMICONDUCTOR AS DEVICES AND RECENT ADVANCES 9 hours

Processing of Semiconductor devices (Brief), p - n Semiconductor as device and Semiconductorjunctions - processes).

TEXT BOOK

1) M.N. Avadhanulu and P.G. Kshirsagar, "A Textbook of Engineering Physics" S.ChandPublishers, 2014(for units 1 and 2)

2) G.Senthil Kumar, "Engineering Physics", VRB publishers, Chennai, 2015 (for Unit 5)

REFERENCES BOOKS

1) Kevin F Brennan, "The Physics of Semiconductors", Cambridge Univ.Press 1999.

2) Peter Y Yu and Manuel Cardona, "Fundamentals of Semiconductors",Spriger, 1996.

CourseCoordinator HOD

U18BSCH201	Environmental Science	L	T	P		C
	Total Contact Hours – 45	3	0	0		3
	Prerequisite course –NIL					
	Course Coordinator:Dr.Chandrabose. Department:-Chemistry					

COURSE OBJECTIVES:-

- To study the interrelationship between living organism and environment.
- To study of the nature and concepts of ecosystem.
- To learn about the integrated themes and biodiversity of an environment.
- To study of pollution control and waste management.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functionsand its value.

COURSE OUTCOMES (COs)

CO1	R	To recognize core concepts and methods from ecological and physical sciences. and theirapplication inenvironmental problem solving
CO2	U	Understand the transnational character of environmental problems and ways ofaddressing them, including interactions across local to global scales
CO3	A	To form methods from ecological and physical sciences and theirapplication in environmental problem solving.

CO4	An	Analyze the impact of engineering solutions in a global and societal context.
CO5	E	Evaluate and understand interactionsbetween social and environmental processes
CO6	C	Plan the gained knowledge to overcome pollution problems

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PS O	PS O
2	CO1	2		3			3		3	2					
	CO2	3		3			2		3	2					
	CO3	3		2			1		3	3					
	CO4	2		2			2		3	2					
	CO5	2		3			2		3	2					
	CO6	2		3			2		3	2					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
			BS							
4	Approval									

UNIT I NATURAL RESOURCES 9hours

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 - Food resources: World food problems, changes caused by agriculture and overgrazing, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies – Land resources: Land as a resource, land degradation, man induced landslides, soilerosion and desertification - Equitable use of resources for sustainable lifestyles.

UNIT II ECOSYSTEMS 9hours

Introduction: concepts 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 andfunction of the following ecosystem :- Forest ecosystem, Grassland ecosystem, Desert ecosystem,Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)- Water conservation, rainwater harvesting, watershed management, Resettlement and rehabilitation - Ethics : Issues andPossible Solutions, Climate change, global warming, acid rain, ozone layer depletion.

UNIT III BIODIVERSITY AND ITS CONSERVATION 9hours

Introduction and Definition - genetic, species and ecosystems diversity, biogeographicallyclassification of India - Value biodiversity: consumptive use, productive use, social, ethical,aesthetic and option values - Biodiversity at global, national and local levels. India as a megadiversity nation, Hot-spots of biodiversity - Threats to biodiversity, habitat, poaching of wildlife,man-wildlife conflicts, Endangered and endemic species of India, Conservation biodiversity - In-situ and Ex-situ conservation of biodiversity.

UNIT IV ENVIRONMENTAL SOLLUTION **9hours**

Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution,Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Solid waste Management:Causes, effects and control measures of urban and industrial wastes - Role of an individual inprevention of pollution - pollution case studies - Disaster Management: floods earthquake,cyclone and landslides.

UNIT V SOCIAL ISSUES AND HUMAN SOPULATION **9hours**

Social issues: Environmental Protection Act, Air (Prevention and Control of pollution) Act, Water(Prevention and Control of pollution) Act, Wildlife protection Act, Forest Conservation Act,Public awareness – Fireworks and its impact on the Environment – Chemicals used in Fireworks– (Fuel –oxidizing Agent – Reducing Agent –Toxic Materials – Fuel –Binder-Regulator) –Harmful nature of ingredients – chemical effects on health due to inhaling fumes.Human population: population growth, variation among nations, Population explosion-FamilyWelfare programs, Environment and human health, Human Rights, Value Education, HIV andAIDS, Women and Child Welfare, Role of Information Technology in Environment and Humanhealth - Case Studies.

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.
3. R.K. Trivedi, Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol.I and II, Enviro Media.
4. Rajagopalan, R, Environmental Studies-From Crisis to Cure', Oxford University Press 2005.
5. K.V.B. Raju and R.T. Ravichandran, "Basics of Civil Engineering"

REFERENCES

1. Cunningham, W.P. Cooper, T.H. Gorhani, Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
2. Dharmendra S. Sengar, Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.

CourseCoordinator HOD

U18ESCS101	**Problem Solving And PythonProgramming**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	3	0	0		3
	Prerequisite course –NIL					
	Course Coordinator:Mr.Sivaraman.R. Department:-Computer Science Engineering					

COURSE OBJECTIVES:-

To gain fundamental knowledge of algorithmic problem solving and pythonprogramming

COURSE OUTCOMES (COs)

CO1	U	Recall algorithmic components to simple computational problems
CO2	R	Demonstrate programs using simple Python statements and expressions.
CO3	A	To gain knowledge regarding control flow and functions associated with python

CO4	An	Use Python data structures, dictionaries for representing compound data
CO5	E	To discriminate knowledge on files, exception, modules and packages in Python for solvingproblems
CO6	C	To design simple application programs

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PS O	PS O
2	CO1	3	3	3	2	3	2	1		2	1	2			
	CO2	3	3	2	2		2		1			2			
	CO3	2	2	1	3	2		1		1		2			
	CO4	2	2	1	2	3	2	1	2	1		2			
	CO5	2	3	1	2	2			2	2	1				
	CO6														

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
				ES						
4	Approval									

UNIT I ALGORITHIMIC PROBLEM SOLVING 9 hours

Introduction to components of a computer system - disks, memory, processor, operating system,compilers – Problems, Solutions, Idea of Algorithm –Representation of Algorithm. Buildingblocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flowchart,programming language), algorithmic problem solving, simple strategies for developingalgorithms (iteration, recursion). Problem Illustrations

UNIT II DATA, EXPRESSIONS, STATEMENTS 9 hours

Python interpreter and interactive mode; values and types: int, float, boolean, string, andlist;variables, expressions, statements, tuple assignment, precedence of operators, comments;modulesand functions, function definition and use, flow of execution, parameters and arguments;Illustrativeprograms: exchange the values of two variables, circulate the values of n variables,distance betweentwo Points.

UNIT III CONTROL FLOW, FUNCTIONS 9 hours

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chainedconditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions:return values, parameters, local and global scope, function composition, recursion; Strings:stringslices, immutability, string functions and methods, string module; Lists as arrays. Illustrativeprograms: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNITIV LISTS, TUPLES, DICTIONARIES 9 hours

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists,listparameters;Tuples: tuple assignment, tuple as return value; Dictionaries: operationsandmethods;advancedlist,Processing list comprehension; Illustrative programs: selection sort,insertion sort, mergesort, histogram.

UNIT V FILES, PACKAGES **9hours**

Files and exception: text files, reading and writing files, errors and exceptions, handlingexceptions, packages: NumPy, SciPy, Matplotlib, Scikit-learn, Scilab Interface.

TEXT BOOKS

1.

Allen B. Downey, 'Think Python: How to Think Like a Computer Scientist', 2nd edition, Updated for Python3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

2.Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updatedf

or Python 3.2, Network Theory Ltd., 2011.

REFERENCES

1. John V Guttag, ―Introduction to Computation and Programming Using Python'', Revisedand expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming inPython: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
4. Kenneth A. Lambert, ―Fundamentals of Python: First Programs‖, CENGAGE Learning,2012.
5. Charles Dierbach, ―Introduction to Computer Science using Python: A ComputationalProblem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, ―Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers,LLC, 2013.

CourseCoordinator HOD

U18ESME101	Engineering Graphics Design	L	T	P		C
	Total Contact Hours – 75	1	0	4		3
	Prerequisite course –Mathematics 1					
	Course Coordinator:Mr.T.Manikandan. Department:-Mechanical Engineering					

COURSE OBJECTIVES:-

To Prepare students to design a system, component, or process to meet desired needs, using the techniques, skills, and modern engineering tools necessary for engineering practice

COURSE OUTCOMES (COs)

CO1	R	Recall the principle of Engineering Graphics
CO2	U	Explain the standards of engineering graphics.
CO3	A	Exposure to basics of building construction
CO4	An	Differentiate computer-aided geometric design
CO5	E	Predict visual aspects of EngineeringDesign.
CO6	C	Design and producing drawings by using CAD.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3			2			3							

	CO2	3	3	1		3	2								
	CO3			3											
	CO4											3			
	CO5	3						1							
	CO6														
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)		
						ES									
4	Approval														

UNIT I TRADITIONAL ENGINEERING GRAPHICS

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; DrawingPrinciples; Isometric Projection; Surface Development; Perspective; Reading a Drawing;Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, ShortestDistance.

UNIT II COMPUTER GRAPHICS

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; ModelViewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing;Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to BuildingInformation Modelling (BIM)(Except the basic essential concepts, most of the teaching part can happen concurrently inthe laboratory)

UNITIII INTRODUCTION TO ENGINEERING DRAWING (9+2Hrs)

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain, Diagonal and Vernier Scales; Draw simple annotation, dimensioning and scale. Construction of Conic sections; Cycloid, Epicycloid, Hypo cycloid and Involute of circle;

UNIT IV ORTHOGRAPHIC PROJECTIONS (10+2 Hrs)

Principles of Orthographic Projections; Conventions; Projections of points and Orthographicprojection of lines in first quadrant - Parallel to both the planes – Perpendicular to oneplane –Parallel to one plane and inclined to other plane – Inclined to both the planes;Projections ofplanes inclined to either HP or VP;

UNIT V PROJECTIONS OF REGULAR SOLIDS& ISOMETRIC PROJECTIONS(10+3Hrs)

Projection of solids in first quadrant – Prism, Pyramid, Cone and Cylinder inclined to one plane;Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions – Isometric Views of Simple Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa;

UNIT VI SECTIONSOF SOLIDS AND DEVELOPMENT OF SURFAC(10+3Hrs)

Sectional view of Prism, Cylinder, Pyramid, Cone (simple position in first quadrant) with cutting planes perpendicular to one plane and parallel or inclined to another plane– True shape of sections; Development of lateral surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone;

UNIT VII BUILDING DRAWING (9+2Hrs)

Introduction to building drawing; Types of Projection adopted in Building Drawing; Scales forvarious types of Drawings,Symbols, Conventions and Abbreviations.Drawing of residential singleand two storied buildingswith detail of Line plan, Foundation Plan, Ground floor Plan, First floorplan, Elevation and Sections.

UNIT VIII OVERVIEW OF COMPUTER GRAPHICS (12+3 Hrs)

Introduction to CAD; Basic commands; Coordinate systems; Setting up of units and drawinglimits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographicconstraints, Snap to objects manually and automatically; Setup a drawing with proper scale–Dimensioning commands, Editing Dimensions and Dimension text; Producing drawings byusing various coordinate input entry methods to draw straight lines, Applying various ways ofdrawing circles;Create basic drawing of objects such as polygon and general multi-line figures;Creating orthographic views of simple solids like prism, pyramid, cylinder, cone. Drawingsectional views of prism, pyramid, cylinder and cone; Preparation of fabrication drawing(Development of surfaces); Drawing front view, top viewand side view of objects from the givenpictorial view; Creation of 3-D models of simple objects.

TEXT BOOKS

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar PublishingHouse
2. Shah, M.B. &Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals.

CourseCoordinator HOD

U18ESCS1L1	**Problem Solving And PythonProgramminglaboratory**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	0	0	3		1.5
	Prerequisite course –NIL					
	Course Coordinator: Ms. Jayapriya. Department:-Computer Science Engineering					

COURSE OBJECTIVES:-

To enhance the practical knowledge on writing programs using Python

COURSE OUTCOMES (COs)

CO1	R	Write, test, and debug simple Python programs.
CO2	U	Understand Python programs with conditionals and loops
CO3	A	Develop Python programs step-wise by defining functions and calling them
CO4	An	Use Python lists, tuples, dictionaries for representing compound data
CO5	E	Read and write data from/to files in Python and to simulate using the packages Scilab, NumPy and Matplotlib
CO6	C	Design a program for simple application

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	3	2	3	3	2	2	2	2		2		2	2
	CO2	3	3	1	3	3	2	1	2	2	2	2		2	2
	CO3	3	3	2	2	2	2		2	2	2	2		2	2
	CO4	3	2	3	3	3	2	2	2	2	1			2	2
	CO5	3	3	3	3	2	2		2	2	1	2			

	CO6	3	3	3	3	3							2	2

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)	
				ES							
4	Approval										

LIST OF EXPERIMENTS FOR PROBLEM SOLVING AND PYTHON PROGRAMMING

LAB

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. ExSOnentiation (SOwer of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Find the most frequent words in a text read from a file
11. Simulate elliptical orbits in Pygame
12. Simulate bouncing ball using Pygame
13. Simulate matrix operations with Scilab
14. Simulate fitting curve with NumPy and Matplotlib

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux and Scilab

CourseCoordinator HOD

SEMESTER – III

U18BSMA301	**Partial Differential Equations and Transformation**	**L**	**T**	**P**		**C**
	Total Contact Hours – 60	3	1	0		4
	Prerequisite course –Engineering Mathematics I& II					
	Course Coordinator: Dr.Ramya Department:-Mathematics					

COURSE OBJECTIVES:-

The course should enable the student to

- Grasp the Fourier series expansion for given periodic function in specific intervals andtheir different forms.
- Learn techniques of solving the standard types of first order and second order partialdifferential equations.
- Learn solving wave and heat equation using Fourier series.
- Understand the problems using Fourier transform and their properties.
- Understand the problems using Z - transform and their properties.

COURSE OUTCOMES (COs)

CO1	R	To remember the formulas and equations to solve the problems..
CO2	U	Understand to solve PDE and transformation techniques.
CO3	A	Apply the basics of Z – Transform in its applicability to discretely varyingfunctions, gained the skill of formulate certain problems in terms of differenceequations and solve them using the Z – Transform techniques.
CO4	An	To analysis the boundary value problems and differential equations oftwo-pointboundary value problems, boundary value problems for partial differentialequations, etc...
CO5	Ev	To evaluate the standard types of first order and second order partial differentialequations.
CO6	C	Finding Solution of difference equations using Z – Transform.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3					2			1					
	CO2	2		3					1		2				
	CO3	2			3										
	CO4	2						2		3				1	
	CO5		1												
	CO6														

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
			BS							

4	Approval		

UNIT I Fourier series 12 hours

Dirichlet's conditions – General Fourier Series – Half range Sine and Cosine series – Parseval'sIdentity – Harmonic Analysis.

UNIT II Partial Differential Equations 12 hours

Formation – Solutions of standard types of first order equations – Lagrange's linear equations – Linear partial differential equation of second and higher order with constant coefficients.

UNIT IIIBoundary Value Problems for Partial Differential Equations 12 hours

Classifications second order linear partial differential equations – Solution of one

dimensionalwave equation – One dimensional heat equation – Steady state solution of two dimensional heatequation – Fourier series solutions in Cartesian coordinates.

UNIT IV Fourier Transform 12hours

Fourier integral theorem (without proof) – Fourier transform pairs – Fourier sine and cosinetransform – Properties – Transforms of simple functions – Convolution theorem – Parseval'sidentity.

UNIT V Z – Transform and Difference Equations 12 hours

Z – Transform – Elementary properties – Inverse Z – Transform – Convolution theorem – Formation of difference equations – Solution of difference equations using Z – Transform.

Text Books / Reference books

1. S. J. Farlow, Partial Differential Equations for Scientist and Engineers, Dover Publications1993.
2. R. Haberman, Elementary Applied partial differential equations with Fourier Series andBoundary Value Problems, 4 th Ed., Prentice Hall, 1998.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 th Edition, 2001.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 9 th Edition, John Willie & Sons,2006.
5. Manish Goya and .N.P Bali l, Transforms and Partial Differential Equations, UniversityScience Press, Second Edition, 2010.
6. Venkataraman. M. K. "Engineering Mathematics Volume III", 13 th Edition NationalPublishing Company, Chennai, 1998.

CourseCoordinator HOD

U18PCEE301	**Electrical Circuit Analysis**	**L**	**T**	**P**		**C**
	Total Contact Hours – 60	3	1	0		4
	Prerequisite course –Basic Electrical & Electronics Engineering					
	Course Coordinator: Mrs.R.Rathika. Department:-EEE					

COURSE OBJECTIVES:-

To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems.

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to

CO1	R	Remember network theorems for the analysis of electrical circuits.
CO2	U	Understand the First and Second order electrical networks
CO3	A	Apply the theorems to solve the electrical network problems
CO4	An	Infer circuit response using Laplace transform and frequencyresponse methods.
CO5	Ev	Predict the two port network parameters.
CO6	C	To create the two port networks.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	3		3		2		1			1	3	3	
	CO2	3		3	3		2					1		3	
	CO3	3	3		3		2					1		3	
	CO4	3	3		3		2					1	3	3	

	CO5	3			3		2					1		3
	CO6	3			3		2					1		3

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)	
					PC						
4	Approval										

UNIT I Network Theorems 12 hours

Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfertheorem, Reciprocity theorem, Compensation theorem.Analysis with dependent current andvoltage sources.Node and Mesh Analysis.Concept of duality and dual networks.

UNIT II Solution of First and Second order networks 12 hours

Solution of first and second order differential equations for Series and parallel R-L, R-C, R- L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.

UNIT III Sinusoidal steady state analysis 12 hours

Representation of sine function as rotating phasor, phasor diagrams, impedances andadmittances, AC circuit analysis, effective or RMS values, average power and complex power.Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, IdealTransformer.

UNIT IV Electrical Circuit Analysis Using Laplace Transforms 12 hours

Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform forstandard inputs, convolution integral, inverse Laplace transform, transformed network withinitial conditions. Transfer function representation. Poles and Zeros.Frequency response(magnitude and phase plots), series and parallel resonances.

UNIT V Two Port Network and Network Functions 12 hours

Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters,admittance parameters, transmission parameters and hybrid parameters, interconnections of twoport networks.

Text Books

1. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.
2. D. Roy Choudhury, “Networks and Systems”, New Age International Publications, 1998.

References

1. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education, 2013.
2. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education, 2004.
3. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.

CourseCoordinator HOD

U18PCEE302	Analog Electronic Circuits	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite course – Basic Electrical & Electronic Engineering				
	Course Coordinator: Dr.T.R.Rangaswamy. Department:-EEE				

COURSE OBJECTIVES:- To understand the fundamental concepts, operation and applications of Analog Electronic Circuits

COURSE OUTCOMES (COs)

CO1	R	Recall the operation of P-N junction Diode&Zener Diode, Bjt, MOSFET, Opp-Amplifier,
CO2	U	Understand the characteristics and working of P-N junction Diode, Zener Diode, Bjt, MOSFET, Opp-Amplifiers and power amplifiers, Clipper & Clamper circuits
CO3	Ex	Solve different configurations of BJT & MOSFET and power & Operation amplifiers applications
CO4	A	Analyze the Diode circuits, Multistage & Direct Coupled amplifiers, Differential & Power amplifiers.
CO5	Ev	Criticize linear applications of Opp-Amplifiers and power amplifiers
CO6	D	Design application of Diode ,Transistor and non- linear Opp-amplifiers

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	1	3	3					1			1		3	2
	CO2	1	3	3					1			1		3	2
	CO3	1	3	3					1			1		3	2
	CO4	1	3	3					1			1		3	2
	CO5	1	3	3					1			1	3	3	2
	CO6	1	3	3					1			1	3	3	2

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

UNIT I Diode circuits 5 hours

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits.

UNIT II BJT circuits 8 hours

Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common-collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits

UNIT III MOSFET circuits 8 hour

MOSFET structure and I-V characteristics.MOSFET as a switch. MOSFET as an amplifier:

small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

UNIT IV Differential, multi-stage and operational amplifier 8 hours

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

UNIT V Linear applications of op-amp 8 hours

Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift).Analog to Digital Conversion.

UNIT VI Nonlinear applications of op-amp 8 hours

Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector.Monoshot.

Text Books

1. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.

References

1. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
2. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
3. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

CourseCoordinator HOD

U18PCEE303	**Electrical Machines-I**		**L**	**T**	**P**		**C**
	Total Contact Hours – 45		3	0	0		3
	Prerequisite course – Basic Electrical & Electronic Engineering						
	Course Coordinator: Mrs.Anitha. Department:-EEE						
COURSE OBJECTIVES:- To understand the fundamental concepts, operation and applications of Analog Electronic Circuits							
COURSE OUTCOMES (COs)							
CO1	R	Remember basic concepts of magnetic circuits.					
CO2	U	Understand the concepts of linear and non-linear magnetic circuits					
CO3	A	Classify Ampere Law &BiotSavart Law for magnetic fields & circuits					
CO4	An	Analyze the construction and operation of a DC machine					
CO5	Ev	Predict the characteristic of a DC machine					

CO6	C	Develop the equivalent circuit and phasor diagram oftransformer and analyze their performance													
	Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low														
1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	2	1			3				2		1	2	2	1
	CO2	2	1			3				2			2	2	1
	CO3	1	3			3				2			2	2	2
	CO4	2	2			3			2	2		3	3	3	3
	CO5	2	2			3			2	2		3	3	3	3
	CO6	2	1			3			1	2				3	3
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)		Any other	Project/Term Paper/ Seminar/ Internship(PR)
							PC								
4	Approval														

UNIT I Magnetic fields and magnetic circuits 7 hours

Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law andBiotSavart Law; Visualization of magnetic fields produced by a bar magnet and a currentcarrying coil - through air and through a combination of iron and air; influence of highlypermeable materials on the magnetic flux lines.

UNIT II Electromagnetic force and torque 9 hours

B-H curve of magnetic materials; flux-linkage vs current characteristic of magnetic circuits;linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partialderivative of stored energy with respect to position of a moving element; torque as a partialderivative of stored energy with respect to angular position of a rotating element. Examples -galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency.

UNIT III DC machines 8 hours

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces orshoes, air gap and armature core, visualization of magnetic field produced by the field windingexcitation with armature winding open, air gap flux density distribution, flux per pole, inducedEMF in an armature coil. Armature winding and commutation - Elementary armature coil andcommutator, lap and wave windings, construction of commutator, linear commutationDerivation of back EMF equation, armature MMF wave, derivation of torque equation,armature reaction, air gap flux density distribution with armature reaction.

UNIT IV DC machine - motoring and generation 9 hours

Armature circuit equation for motoring and generation, Types of field excitations – separatelyexcited, shunt and series. Open circuit characteristic of separately excited DC generator, backEMF with armature reaction, voltage build-up in a shunt generator, critical field resistance andcritical speed. V-I characteristics and torque-speed characteristics of separately excited, shuntand series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines.

UNIT V Transformers 12 hours

Principle, construction and operation of single-phase transformers, equivalent circuit, phasordiagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests,polarity test, back-to-back test, separation of hysteresis and eddy current losses Three-phasetransformer - construction, types of connection and their comparative features, Paralleloperation of single-phase and three-phase transformers, Autotransformers - construction,principle, applications and comparison with two winding transformer, Magnetizing current,effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current,Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changingtransformers - No-load and on-load tap-changing of transformers, Three-winding transformers.Cooling of transformers.

Text Book

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education,2013.

2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBSPublishers, 2004.

References

1. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
3. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

CourseCoordinator HOD

U18PCEE304	**Electromagnetic Fields**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	3	1	0		4
	Prerequisite course –Mathematics II&Basic Electrical & Electronics Engineering					
	Course Coordinator: Dr.S.P.Vijayaragavan. Department:-EEE					

COURSE OBJECTIVES:-To gain knowledge about the theory and problems in Electromagnetic Fields.

COURSE OUTCOMES (COs)

CO1	R	To outline the concepts of static magnetic fields, Electromagnetic forces,materials and Time varying fields.
CO2	U	To understand the foundations of electromagnetism and electrostatics and theirapplications.
CO3	A	To apply the various types Maxwell's Equation in an electromagnetic fields.
CO4	An	Analyze the vector calculus for the static electric fields in standardconfigurations.
CO5	Ev	Predict magnetic forces and time varying fields
CO6	C	Develop Solution of Laplace and Poisson's equation

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3													
	CO2	3					2							3	2
	CO3	3	1							2				3	2
	CO4	3								2				3	2

	CO5	3	1							2				3	2
	CO6	3	1				2			2				3	2
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)		
							PC								
4	Approval														

UNIT I Review of Vector Calculus 6 hours

Vector algebra, addition, subtraction, components of vectors, scalar and vector multiplications, tripleproducts, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus-differentiation, partial differentiation, integration, vector operatordel, gradient, divergence and Curlintegral theorems of vectors. Conversion of a vector from one coordinate system to another.

UNIT II Static Electric Field 9 hours

Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface andVolume charge distributions. Gauss law and its applications.Absolute Electric potential, potentialdifference, Calculation of potential differences for different configurations.Electric dipole,Electrostatic Energy and Energy density.

UNIT III Conductors, Dielectrics and Capacitance 6 hours

Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditionsof perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of atwo wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson'sequation, Application of Laplace's and Poisson's equations.

UNIT IV Static Magnetic Fields 6 hours

Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.

UNIT V Magnetic Forces, Materials and Time Varying Fields 9 hours

Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.
Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces. Boundary Conditions.

Module VI Electromagnetic Waves 9 hours

Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Waveequation in Phasor form, Plane waves in free space and in a homogenous material. Wave equationfor a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skineffect. Poynting theorem.

Text Books

1. M. N. O. Sadiku, “Elements of Electromagnetics”, Oxford University Publication, 2014.
2. A. Pramanik, “Electromagnetism - Theory and applications”, PHI Learning Pvt. Ltd, NewDelhi, 2009.
3. W. Hayt, “Engineering Electromagnetics”, McGraw Hill Education, 2012.

References

1. Pramanik, “Electromagnetism-Problems with solution”, Prentice Hall India, 2012.
2. G. W. Carter, “The electromagnetic field in its engineering aspects”, Longmans, 1954.
3. W. J. Duffin, “Electricity and Magnetism”, McGraw Hill Publication, 1980.
4. W. J. Duffin, “Advanced Electricity and Magnetism”, McGraw Hill, 1968.
5. E. G. Cullwick, “The Fundamentals of Electromagnetism”, Cambridge University Press,1966.
6. D. Popovic, “Introductory Engineering Electromagnetics”, Addison-Wesley EducationalPublishers, International Edition, 1971.

CourseCoordinator HOD

PRACTICAL

U18PCEE3L1	Analog Electronic Circuits Laboratory	L	T	P		C
	Total Contact Hours – 30	0	0	3		1.5
	Prerequisite course –Basic Electrical & Electronics Engineering					
	Course Coordinator :Dr.T.R.Rangaswamy. Department:-EEE					

COURSE OBJECTIVES:-

To gain the application knowledge of

- Rectifiers.
- BJT characteristics and Amplifiers.
- MOSFET Characteristics and Amplifiers
- Power Amplifiers
- OP-AMP

COURSE OUTCOMES (COs)

CO1	R	Remember the applications of Diodes &Transistors
CO2	U	Understand the characteristics of MOSFET amplifiers& BJT amplifiers
CO3	A	Classify the P,PI and PID control Applications using op-amp
CO4	An	Differentiate Inverting, Non-inverting and Differential amplifier
CO5	Ev	Production of various waveforms using Opp-amplifiers.
CO6	C	Design a circuit for Analog to Digital conversion

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1		3	2		2			3		1	3			
	CO2		3	2		2			3		1	3	2	2	3
	CO3		3	2		2			3		1	3		2	3
	CO4		3	2		2			3		1	3		2	3
	CO5		3	2		2			3		1	3		2	3

	CO6		3	2		2			3		1	3	3	2	3
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)		
							PC								
4	Approval														

List of Experiments

1. Diode clipping and clamping circuits
2. Rectifier Circuits
3. BJT CE,CC& CB amplifier
4. Characteristics of MOSFET
5. Differential amplifier
6. Inverting & Non inverting amplifiers
7. Differential Amplifier using OP-AMP
8. P, PI and PID controllers
9. Analog to Digital Conversion
10. Waveform generators with OP-AMP

CourseCoordinator HOD

U18PCEE3L2	**Electrical Machines Laboratory– I**	**L**	**T**	**P**		**C**
	Total Contact Hours – 30	0	0	3		1.5
	Prerequisite course –Basic Electrical &Electronics Engineering					
	Course Coordinator :Mrs.Anitha. Department:-EEE					

COURSE OBJECTIVES:-

To expose the students to the operation of D.C. machines and transformers andgive them experimental skill.

COURSE OUTCOMES (COs)

CO1	R	Recal the concepts of AC and DC machines & Transformers
CO2	U	Understand the characteristics of DC machines through conducting ofexperiments
CO3	A	Classify the load test of AC/DC machines
CO4	An	- To analyze the characteristics of transformers and AC/DC Machines through conducting ofexperiments
CO5	Ev	- Evaluate the performance of DC machines and Transformers.
CO6	C	- Plan a real time testing of AC,DC machines & transformers

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PS O	PS O
2	CO1	3	3		2		3	1				3	3		

	CO2	3	3		2		3	1				3		3	2
	CO3	3	3		2		3	1				3	2	3	2
	CO4	3	3		2									3	2
	CO5	3	2		2									3	2
	CO6	3	2		2							2	2	3	2

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

List Of Experiments

1. Open Circuit characteristics of DC shunt generator
2. Load characteristics of separately excited generator
3. Load characteristics of DC shunt generator
4. Load characteristics of DC shunt generator
5. Speed control of DC shunt motor
6. Swinburne's test
7. Hopkinson's test
8. Load test on single phase transformer
9. Open Circuit and short circuit test on single phase transformer
10. Sumpener's test
11. Parallel operation of single phase transformers
12. Three phase transformer connections, scott connections.
13. Field's test on DC series motor
14. Seperation of no load losses In a single phase transformer
15. Study of DC starters

CourseCoordinator HOD

SEMESTER IV

U18PCEE401	**Digital Electronics**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	3	0	0		3
	Prerequisite course –Basic Electrical &Electronics Engineering					
	Course Coordinator : Dr.V.Jayalakshmi Department:-EEE					

COURSE OBJECTIVES:-

Students will be able understand working of logic gates. Design and implementCombinational and Sequential logic circuits. Design of Analog to Digital Conversion technique.

COURSE OUTCOMES (COs) At the end of this course, Students Will demonstrate the ability to

CO1	R	State the Fundamentals of Digital Systems and logicfamilies

CO2	U	Classify on Combinational Digital Circuits
CO3	An	Relate the Sequential circuits and systems
CO4	A	Implement the A/D and D/A Converters
CO5	Ev	Argue the Semiconductor memories and Programmable logicdevices
CO6	D	Design and implement the logic circuits & ADC technique.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1		3	2	2							2		3	2
	CO2		3	2	2							2	3	3	2
	CO3		3	2	2							2	2	3	2
	CO4		3	2	2							2	3	3	2
	CO5	3		3	3	2				2		2		3	1
	CO6														

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

UNIT I Fundamentals of Digital Systems and logic families 9 hours

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations,Boolean algebra, examples of IC gates, number systems-binary, signed binary, octalhexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes,error detecting and correcting codes,characteristics of digital lCs, digital logic families, TTL,Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

UNIT II Combinational Digital Circuits 9 hours

Standard representation for logic functions, K-map representation, simplification of logicfunctions using K-map, minimization of logical functions. Don't care conditions,Multiplexer,De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry lookahead adder,serial adder, ALU, elementary ALU design, popular MSI chips, digitalcomparator, parity checker/generator, code converters, priority encoders, decoders/drivers fordisplay devices,Q-M method of function realization.

UNIT III Sequential circuits and systems 9 hours

A 1-bit memory, the circuit properties of Bitable latch, the clocked SR flip flop, J- K-TAndtypes flipflops,applications of flip flops, shift registers, applications of shift registers, serial toparallelconverter, parallel to serial converter, ring counter, sequence generator,ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, specialcounter IC's, asynchronous sequential counters, applications of counters.

UNIT IV A/D and D/A Converters 9 hours

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter,specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit,analog to digital converters: quantization and encoding, parallel comparator A/D

converter,successive approximation A/D converter, counting A/D converter, dual slopeA/D converter,A/D converter using Voltage to frequency and voltage to time conversion, specificationsof A/D converters, example of A/D converter ICs

UNIT V Semiconductor memories and Programmable logic devices. 9 hours

Memory organization and operation, expanding memory size, classification andcharacteristics of memories, sequential memory, read only memory (ROM), read and writememory(RAM), content addressable memory (CAM), charge de coupled device memory(CCD), commonly used memory chips, ROM as a PLD, Programmable logic array,Programmable array logic, complex Programmable logic devices (CPLDS), FieldProgrammable Gate Array (FPGA).

Text book

1. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

References

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

CourseCoordinator HOD

U18PCEE402	**Electrical Machines-II**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	3	1	0		4
	Prerequisite course –Basic Electrical & Electronic Engineering					
	Course Coordinator: Mrs.S.Anitha. Department:-EEE					

COURSE OBJECTIVES:-

To give the students a fair knowledge on the working of various AC machinesand thecharacteristics

COURSE OUTCOMES (COs) At the end of this course, Students Will demonstrate the ability to

CO1	R	Memorize the type of winding in AC machines
CO2	U	Explain the fundamental knowledge of Pulsating and revolving magneticfields
CO3	An	Examine the Construction, principle of operation and performance of inductionmachines.
CO4	A	Sketch the Construction, principle of operation and performance of singlephase induction motors
CO5	Ev	Defend the Construction and performance of salient and non – salient typesynchronous generators.
CO6	C	Design procedure for synchronization and parallel operation.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	2	1			3				2		1		2	1
	CO2	2	1			3				2				2	1
	CO3	1	3			3			2	2			3	2	2
	CO4	2	2			3			2	2		3		3	3
	CO5	2	2			3			1	2		3	3	3	3
	CO6														

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

UNIT I Fundamentals of AC machine windings 9 hours

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single-turnoil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding,winding axis, 3D visualization of the above winding types, Air-gap MMF distribution withfixed current through winding - concentrated and distributed, Sinusoidally distributed winding,winding distribution factor.

UNIT II Pulsating and revolving magnetic fields 9 hours

Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternatingcurrent, Pulsating fields produced by spatially displaced windings, Windings spatially shiftedby 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120degrees (carrying three-phase balanced currents), revolving magnetic field.

UNIT III Induction Machines 12 hours

Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting andMaximum Torque.Equivalent circuit.Phasor Diagram, Losses and Efficiency.Effectofparameter variation on torque speed characteristics (variation of rotor and stator resistances,stator voltage, frequency). Methods of starting, braking and speed control for induction motors.Generator operation.Self-excitation.Doubly-Fed Induction Machines.

UNIT IV Single-phase induction motors 5 hours

Constructional features, double revolving field theory, equivalent circuit, determination ofparameters. Split-phase starting methods and applications.

UNIT V Synchronous machines 10 hours

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalentcircuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation.Operating characteristics of synchronous machines, V-curves.Salient pole machine – tworeaction theory, analysis of phasor diagram, power angle characteristics.Parallel operation ofalternators - synchronization and load division.

Text/References

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
4. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
5. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
6. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons,2007.

CourseCoordinator HOD

U18PCEE403	Power Electronics	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite course –Analog Electronic circuits				
	Course Coordinator: Mrs.R.Rathika. Department:-EEE				

COURSE OBJECTIVES:-

To analyze and design the Power electronic circuits based on varioussemiconductor switches and switching characteristics

COURSE OUTCOMES (COs) At the end of this course, Students Will demonstrate the ability to

CO1	R	Define various power switching devices.
CO2	U	Describe controlled thyristor rectifier circuits.
CO3	A	Sketch the operation of DC-DC choppers.
CO4	An	Organize the operation of single Phase voltage source inverters.
CO5	Ev	Appraise the operation of three Phase voltage source inverters.
CO6	C	Design power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	2	2	2	2	2	3					1		2	-
	CO2	3	3	3		2	2			3		2		2	-
	CO3	3	3	3			2			3		2	2	2	-
	CO4	3	3	3	2		2			3		2		2	-
	CO5	3	3	3	2		2			3		2	3	2	-
	CO6	1				2			1						

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

UNIT I Power switching devices 10hours

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage andcurrent commutation of a thyristor; Gate drive circuits for MOSFET and IGBT.

UNIT II Thyristor rectifiers 7 hours

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier withR-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load andhighly inductive load; Input current wave shape and power factor.

UNIT III DC-DC converters 10hours

Elementary chopper with an active switch and diode, concepts of duty ratio and average

voltage,power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control ofoutput voltage, Power circuit of a boost converter, analysis and waveforms at steady state,relation between duty ratio and average output voltage.

UNIT IV Single-phase voltage source inverter 10hours

Power circuit of single-phase voltage source inverter, switch states and instantaneous outputvoltage, square wave operation of the inverter, concept of average voltage over a switching cycle,bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and outputvoltage.

UNIT V Three-phase voltage source inverter 8 hours

Power circuit of a three-phase voltage source inverter, switch states, instantaneous outputvoltages, average output voltages over a sub-cycle, three-phase sinusoidal modulation.

Text Books

1. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science; Business Media, 2007.
2. L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.

References

1. M. H. Rashid, "Power electronics: circuits, devices, and applications", Pearson EducationIndia, 2009.
2. N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design",John Wiley; Sons, 2007.

CourseCoordinator HOD

U18PCEE404	**Digital Signal Processing**	**L**	**T**	**P**		**C**
	Total Contact Hours – 40	3	1	0		4
	Prerequisite course –Partial Differential Equations and Transformation& Digital Electronics					
	Course Coordinator: Mrs.S.Sherine. Department:-EEE					

COURSE OBJECTIVES:-

To gain fair knowledge of Digital Signal Processing.

COURSE OUTCOMES (COs) At the end of this course, Students Will demonstrate the ability to

CO1	R	Define signals mathematically in continuous and discrete-time, and in thefrequency domain..
CO2	U	Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.
CO3	A	Implement the digital signal processing for the analysis of signals
CO4	An	Examine the discrete-time systems using z-transform.
CO5	E	. Evaluate the various advanced Programmable DSPs and understand the Code Composer Studio
CO6	C	Design digital filters for various applications.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	2	2		2	3				2	3		3	
	CO2	3	3	2		2	3		2			3		2	
	CO3	3				2	3				2	2		2	
	CO4	3	3	2		3	3	2	2	2	2	3	2	2	
	CO5	3	3	2		3	3	2	2	2	2	3	2	3	3

	CO6	3						1	2		2		2	2	3
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)		
							PC								
4	Approval														

UNIT I Discrete-time signals and systems 8hours

Discrete time signals and systems: Sequences; representation of signals on orthogonal basis;Representation of discrete systems using difference equations, Sampling and reconstruction ofsignals - aliasing; Sampling theorem and Nyquist rate.

UNIT II Z-transform 8 hours

Z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z-transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain,Inverse z-transforms.

UNIT III Discrete Fourier Transform 10hours

Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT,Convolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementationof Discrete Time Systems.

UNIT IV Design of Digital filters 12 hours

Designof FIR Digital filters: Window method, Park-McClellan's method. Design of IIRDigitalFilters: Butterworth, Chebyshev and Elliptic Approximations; Low-pass, Band-pass,and-stop and High-pass filters.Effect of finite register length in FIR filter design. Parametricand non-parametric spectral estimation. Introduction to multi-rate signal processing.

UNIT V Applications of Digital Signal Processing 7 hours

Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMAModel, Linear Mean-Square Estimation, Wiener Filter.

Text Books

1. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall,1989.
2. J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms AndApplications", Prentice Hall, 1997

Reference Books

1. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill,2011.
2. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing",Prentice Hall, 1992.
3. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.
4. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, "Digital Signal Processing", John Wiley Sons, 1988.

CourseCoordinator HOD

U18BSMA402	Probability, Statistics and Numerical Methods	L	T	P		C
	Total Contact Hours – 60	3	1	0		4
	Prerequisite course –Engineering Mathematics 1&II					
	Course Coordinator :Dr.Manimegalai. Department:-Mathematics					

COURSE OBJECTIVES:-

The course should enable the student to

1. Learn basics of probability, Baye's Theorem. Understand the concept of random variable,moment generating functions and their properties; learn standard distributions in discreteand continuous cases.
2. Learn measures of central tendency and correlation and regressions, rank correlation,statistical intervals for single sample and test of hypothesis for a small and large sample.
3. Ability to apply knowledge of mathematics, science and engineering.
4. Ability to analyze and interpret data
5. Identify , formulate and solve equations by various methods

COURSE OUTCOMES (COs) At the end of this course, Students Will demonstrate the ability to

CO1	R	Memorize the concept of numerical differentiation and integration usingTrapezoidal and Simpson's rules..
CO2	U	Discuss to Learn the basic idea of statistics including measures of central tendency.Identify the appropriate hypothesis testing procedure based on type of outcomevariable and number of samples.
CO3	A	Solveequations by Newton-Raphson and Regula-Falsi methods and system of linearequations by various methods
CO4	An	Compare the value of a dependent variable in the given data by Newton's forwardand backward difference formulae and also unequal intervals.
CO5	E	Argue the probability using addition and multiplication theorem and the moments ofdistributions using moment generating functions
CO6	C	Design and solution for engineering applications

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3			3	3			1		2			3	
	CO2	3			3	2			1		2				3
	CO3	3			3	3			1		2			3	
	CO4	3			3	3			1		2			3	
	CO5	3			3	3			1		2				
	CO6														

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
			BS							

4	Approval		

UNIT I Probability Distribution 12 hours

Probability – Axioms of probability – Conditional probability – Baye's theorem –Random variables – Binomial – Poisson – Geometric – Uniform – Exponential and normaldistribution and their properties.

UNIT II Statistics and Testing of Hypothesis 12 hours

Measures of central tendency – Moments – Skewness and kurtosis – Correlation and Regression –Rank correlation – Test of significance: Large sample test for single proportion, difference ofproportions – Chi Square test for goodness fit and independence of attributes.

UNIT III Solution of Polynomial and Transcendental Equations 12 hours

Bisection method, Newton-Raphson method and Regula-Falsi method for single variable-solutions of linear system of equations by Gaussian, Gauss-Jordan, Jacobian and Gauss-Siedalmethods.

UNIT IV Finite Difference and Interpolation 12 hours

Finite differences -Relation between finite difference operators- Interpolation using Newton'sforward and backward difference formulae, Interpolation with unequal intervals-Newton'sDivided difference formula, Lagrange's Interpolation formula.

UNIT V Numerical Differentiation and Integration 12 hours

Numerical Differentiation with interpolation polynomials, Numerical integration by Trapezoidaland Simpson's both 1/3 rd and 3/8 th rules. Double integration using Trapezoidal rule and Simpsonrule.

Text Books /References

1 1.Sastry.S. S "Introductory Numerical Methods" PHI, 2010
2 Jain K.K. Iyengar, S.R.K and Jain, R.K. "Numerical Methods for Scientific andEngineering Computation" 4rd edition, 2005
3 3.Grewal, B.S. "Higher Engineering Mathematics (36th edition)" Khanna PublicationDelhi .
4 Curtis F.Gerald."Applied Numerical Analysis" 7th Edn.Pearson Education, Chennai-600113.3. Dennis G.Zill and Warren S.Wright."Advanced Engineering Mathematics".3rd Edn.Jones & Bartlett Publishers, UK.1992 4 .www.mathforcollege.com.
5 P.Kandasamy, K.Thilagavathy, K.Gunavathi- Numerical methods, S.Chand& Company,2 nd Edition 2010.

CourseCoordinator HOD

U18HSBA401	**Organizational Behavior**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	3	0	0		3
	Prerequisite course –NIL					
	Course Coordinator :Dr Praveen. Department:-Management Studies					

COURSE OBJECTIVES:-

1. Understanding the basic approaches in organization
2. Knowledge on theories of Personality
3. Clear sight on the Decision Making in Groups
4. Analyse the behaviour of individuals and groups in organizations interms of the key factors that influence organizational behaviour. Assessthe potential effects of organizational - level factors (such as structure,culture and change) on organizational behaviour.

COURSE OUTCOMES (COs) At the end of this course, Students Will demonstrate the ability to

CO1	R	List the Frame work of Organizational Behaviour

CO2	U	Describe the Sources of power
CO3	A	Execute the Awareness of the Merits and Demerits of Group decision making.
CO4	An	Examine the Knowledge of the Interpersonal perception
CO5	Ev	Appraise the knowledge of types of Conflicts
CO6	C	Development of leadership including training, Power and Authority

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

		PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3								3				3	1
	CO2	2		1			3	2				1			3
	CO3			3	3			1		2			2	2	
	CO4	1					1					1		3	
	CO5	1		1											2
	CO6														

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
		HS								
4	Approval									

UNIT I **9 hours**

Orgnanizational Behavior – Definition, Need for studying Organizational Behavior, Disciplinesinvolved in the study of Organizational Behavior, -Contributing disciplines and area – Applicationof Organizational Behavior in Business.

UNIT II **9 hours**

Individual behaviour – personality, perception, learning, attitudes inter-personal behavior – Groupand inter-group behaviour.

UNIT III **9 hours**

Group Dynamics – Formal and Informal Group, Group Norms, Group Cohesiveness, GroupBehaviour and Group Decision – Motivation – Need and Importance – Theories of Motivation

UNIT IV

9 hours

Leadership-nature, stles and approaches, development of leadership including laboratory training.Power and Authority – Definition of Power – Types of Power.

UNIT V **9 hours**

Management of change-conflict Management- Management of culture, Cross CulturalManagement.

REFERENCES

1. Uma Sekaran, Organizational Behavior: Text and Cases TMH Publications

2. Ashwathappa K, Organizational Behavior: Text, cases and games, Himalaya Publishers
3. Chandhan JS, Organizational Behavior, Vikas Publishers
4. Stephen Robbins, Organizatonal Behavior, Pearson Education
5. RS Diwedi, Human Relations and Organizational Behavior, Mac Millan.

CourseCoordinator HOD

U18MCTH401	Universal Human Values	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite course –NIL				
	Course Coordinator :Ms.Aarthisuriya. Department:- EEE				

COURSE OBJECTIVES:-

The objective of the course is four fold:

1. Sensitization of student towards self, family (relationship), society and nature.
2. Understanding (or developing clarity) of nature, society and larger systems, on the basis of Human relationships and resolved individuals.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

COURSE OUTCOMES (COs)

At the end of the course, students are expected to become more aware of their surroundings, society, social problems and their sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability.

They would also become sensitive to their commitment towards what they believe in (humane values. humane relationships and humane society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction

U18PCEE4L1	Digital Electronics lab	L	T	P	C
	Total Contact Hours – 45	0	0	3	1.5
	Prerequisite course –Basic Electrical and Electronics Lab				
	Course Coordinator :Dr.V.Jayalakshmi. Department:-EEE				

COURSE OBJECTIVES:-

To enhance the practical knowledge on Digital Electronics and to designthe experiments.

COURSE OUTCOMES (COs) At the end of this course, Students Will demonstrate the ability to

CO1	R	Memorize all digital electronics components
CO2	U	Classify and gain knowledge on sequential circuits.
CO3	A	Demonstrate and develop skill on Counter circuits and the Flip-Flaps
CO4	An	Differentiate comparator &amp and Universal gates
CO5	E	Predict logic and combination logic circuits for industrial applications
CO6	C	Design and will be able develop skill on AD/DA conversion techniques

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PS	PS

2	CO1	1	3	3	2	2						2		O	O
	CO2	1	3	3	2	2						2	2	3	3
	CO3	1	3	3	2	2						2		3	3
	CO4	1	3	3	2	2						2		3	3
	CO5	1	3	3	2	2						2	3	3	3
	CO6	1	3	3	2	2						2		3	3

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

LIST OF EXPERIMENTS

1. Introduction to Digital Electronics lab-Nomenclature of digital ICS, 1 specifications, study ofthe data sheet, concept of vcc and ground, verification of the truth tables of logic gates usingTTL ICS.
2. Implementation of the given Boolean function using logic gates in 2 both sop and pos forms.
3. Verification of state tables of RS, JK, T and D flip-flops using 3 NAND & nor gates.
4. Implementation and verification of decoder/de-multiplexer and 4 encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design and verify the 4-bit synchronous counter.
8. Design and verify the 4-bit asynchronous counter.
9. To design and verify operation of adder and subtractor.
10. To design and verify operation of AD/DA Converter
11. To design & verify the operation of magnitude comparator

CourseCoordinator HOD

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U18PCEE4L2	**Electrical Machines-II Laboratory**	**L**	**T**	**P**		**C**
	Total Contact Hours – 45	0	0	3		1.5
	Prerequisite course –Electrical Machines Laboratory–I					
	Course Coordinator :Mrs.s.Anitha. Department:-EEE					

COURSE OBJECTIVES:-

To expose the students to the operation of synchronous machines and inductionmotors and give them experimental skill.

COURSE OUTCOMES (COs) At the end of this course, Students Will demonstrate the ability to

CO1	R	Recall components of electrical machines

CO2	U	Understand the concept of operation of electrical machines
CO3	A	Execute the performance characteristics of Synchronous generators and load teston alternator.
CO4	An	Analyze the performanceof Three phase Induction motor machines and slip ringinduction motor
CO5	E	Experiment the performance of single phase Induction motor machines.
CO6	C	Plan to Synchronize and parallel operation by dark lamp, bright lamp and synchronoscope methods.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	3	2		3	1					3		3	2
	CO2	3	3	2		3	1					3	3	3	2
	CO3	3	3	2		3	1					3	2	3	2
	CO4														
	CO5														
	CO6														

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					

4	Approval		

LIST OF EXPERIMENTS

1. Regulation of alternator by EMP and MMF method
2. Regulation of alternator by potier ASA method
3. Regulation of salient pole alternator – slip test
4. Load test on alternator
5. Study of A.C. starters
6. V and inverted V curve of synchronous motor.
7. Brake test of three phase squirrel cage induction motor.
8. No load and blocked rotor tests on three phase induction motor and circle diagram andequivalent circuit
9. Load test on single phase induction motor.
10. Equivalent circuit and predetermination of performance of single phase induction motor.
11. Load test on three phase induction motor
12. Load test on three phase slip ring induction motor
13. Synchronizing and parallel operation by dark lamp, bright lamp and synchronoscopemethods.

CourseCoordinator HOD

U18PCEE4L3	Power Electronics Laboratory	L	T	P	C
	Total Contact Hours – 30	0	0	3	1.5
	Prerequisite course –Analog Electronic Circuits				
	Course Coordinator :Mr.S. Sherine Department:-EEE				

COURSE OBJECTIVES:-

To gain fundamental knowledge about Power Electronic devices.

COURSE OUTCOMES (COs) At the end of this course, Students Will demonstrate the ability to

CO1	R	Sate the basic power switching devices
CO2	U	Explain the concept of Thyristor as rectifiers
CO3	A	Implement theconceptofDC-DC boost converter
CO4	An	Examine theconceptofDC-DC buck and boost converter
CO5	E	Apprise Single-phase and three-phasevoltage source inverter
CO6	C	Design Single-phase voltage source inverter and Threephase voltage source inverter

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	3	3		2			2	2	3	3	2		3
	CO2	3	3	3		2			2	2	3	3			3
	CO3	3	3	3		2			2	2	3	3			3
	CO4	3	3	3		2			2	2	3	3			3
	CO5	3	3	3		2			2	2	3	3	3		3
	CO6														

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

List of Experiments

1. Characteristics of Thyristor
2. Characteristics of MOSFET
3. Characteristics of IGBT
4. Single-phase half-wave and full-wave rectifiers
5. Three-phase full-bridge thyristor rectifier
6. Buck Converter
7. Boost Converter
8. DC-DC boost converter
9. Single-phase voltage source inverter
10. three-phasevoltage source inverter

CourseCoordinator HOD

SEMESTER V

U18PCEE501	**POWER SYSTEMS – I(APPARATUS AND MODELING)**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Basic Electrical and Electronics Engineering				
	Course Coordinator :Dr.V.Jayalakshmi. Department:-EEE				

COURSE OBJECTIVES:-

1. To introduce the concepts and phenomenon of different sources of Power Generation.
2. To give an idea about the fundamental concepts of electrical power distribution, both AC & DC.

COURSE OUTCOMES (COs)

CO1	R	Remember the concepts of power systems.
CO2	U	Understand the working of various Components in power system, Over-voltages ,Insulation, DC power transmission and renewable energy generation
CO3	A	Apply various protection Schemes in over voltages.
CO4	An	Analyze simple three-phase circuits. Power Transfer in AC circuits and Reactive Power.
CO5	Ev	Evaluate fault currents for different types of faults and per unit calculations in synchronous motors.
CO6	C	Design steady state, transient and sub-transient equivalent circuits

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	3	3	3	3	2	2		2	1	1		3	
	CO2	3	3	3	3	3							2		3
	CO3	3	3		3	3			2						3
	CO4	3	3	3	3							1		3	
	CO5	3	3	3	3	3				2					3
	CO6	3	3			3	3	3	3		3	2	3		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

SYLLABUS

UNIT I BASIC CONCEPTS 9 Hours

Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids. Generation: Conventional and Renewable Energy Sources. Distributed Energy Resources.Energy Storage. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Synchronous Grids and Asynchronous (DC) interconnections. Review of Three-phase systems. Analysis of simple three-phase circuits. Power Transfer in AC circuits and Reactive Power.

UNIT II POWER SYSTEM COMPONENTS 12 Hours

Overhead Transmission Lines and Cables: Electrical and Magnetic Fields around conductors, Corona. Parameters of lines and cables.Capacitance and Inductance calculations for simple configurations.Travelling-wave Equations. Sinusoidal Steady state representation of Lines: Short, medium and long lines. Power Transfer, Voltage profile and Reactive Power.

Characteristics of transmission lines. Surge Impedance Loading. Series and Shunt Compensation of transmission lines.

Transformers: Three-phase connections and Phase-shifts. Three-winding transformers, auto-transformers, Neutral Grounding transformers. Tap-Changing in transformers.Transformer Parameters.Single phase equivalent of three-phase transformers.

Synchronous Machines: Steady-state performance characteristics. Operation when connected to infinite bus. Real and Reactive Power Capability Curve of generators. Typical waveform under balanced terminal short circuit conditions – steady state, transient and sub-transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per-**UNIT** System and per-UNIT calculations.

UNIT III OVER-VOLTAGES AND INSULATION REQUIREMENTS 6 Hours

Generation of Over-voltages: Lightning and Switching Surges. Protection against Over-voltages, Insulation Coordination.Propagation of Surges. Voltages produced by traveling surges. Bewley Diagrams.

UNITIV FAULT ANALYSIS 9 Hours

Method of Symmetrical Components (positive, negative and zero sequences). Balanced and Unbalanced Faults.Representation of generators, lines and transformers in sequence networks.Computation of Fault Currents.Neutral Grounding.

UNIT V INTRODUCTION TO DC TRANSMISSION & RENEWABLE ENERGY SYSTEMS 9 Hours

DC Transmission Systems: Line-Commutated Converters (LCC) and Voltage Source Converters (VSC). LCC and VSC based dc link, Real Power Flow control in a dc link. Comparison of ac and dc transmission. Solar PV systems: I-V and P-V characteristics of PV panels, power electronic interface of PV to the grid. Wind Energy Systems: Power curve of wind turbine. Fixed and variable speed turbines. Permanent Magnetic Synchronous Generators and Induction Generators. Power Electronics interfaces of wind generators to the grid.

TEXT BOOKS

1. J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education, 1994.
2. O. I. Elgerd, "Electric Energy Systems Theory", McGraw Hill Education, 1995.

REFERENCES:

1. A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 1999.
2. D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education, 2003.
3. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 2012.

CourseCoordinator HOD

U18PCEE502	**CONTROL SYSTEMS**		**L**	**T**	**P**	**C**
	Total Contact Hours – 45		3	1	0	4
	Prerequisite – Engineering Mathematics, Electrical Circuit Analysis					
	Course Coordinator : Ms.G.HemavathyDepartment:-EEE					
COURSE OBJECTIVES:-To understand the modeling of Control systems using transfer function and state-space representations.						
COURSE OUTCOMES (COs)						
CO1	R	Recall the mathematical models of physical systems, control hardware and their models.				
CO2	U	Understand the mathematical models of physical systems, control hardware and their models,. The relationship between time and frequency response.				
CO3	A	Apply the stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems				
CO4	An	Analyze the Time Response and its stability by root locus andRouth-Hurwitz Criteria and Frequency response by Bode plot , polar plot and Nyquist criterion				
CO5	Ev	Evaluate the various parameters of time response , frequency response of control system. andModeling electromechanical applications.				
CO6	C	Create and realize the controllers and compensation techniques that can be used to stabilize				

		the control systems .													
	Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low														
1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1		3	3		2			3	2		2	2	2	3
	CO2		3	3		2			3	2		2		2	3
	CO3		3	3		2			3	2		2		2	3
	CO4		3	3		2			3	2		2		2	3
	CO5		3	3		2			3	2		2		2	3
	CO6		3	3		2			3	2		2	3	2	3
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)					
					PC										
4	Approval														

SYLLABUS

UNIT I INTRODUCTION TO CONTROL PROBLEM 6 Hours

Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems.

Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

UNITII TIME RESPONSE ANALYSIS 10 Hours

Standard test signals. Time response of first and second order systems for standard test inputs.Application of initial and final value theorem. Design specifications for second-order systems based on the time-response.

Concept of Stability.Routh-Hurwitz Criteria.Relative Stability analysis.Root-Locus technique.Construction of Root-loci.

UNIT III FREQUENCY-RESPONSE ANALYSIS 6 Hours

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

UNIT IV INTRODUCTION TO CONTROLLER DESIGN 10 Hours

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems.Root-loci method of feedback controller design.Design specifications in frequency-domain.Frequency-domain methods of design.Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs.Analog and Digital implementation of controllers.

UNIT V STATE VARIABLE ANALYSIS 7 Hours

Concepts of state variables.State space model.Diagonalization of State Matrix.Solution of state equations.Eigenvalues and Stability Analysis.Concept of controllability and observability.Pole-placement by state feedback.

Discrete-time systems.Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

UNIT VI INTRODUCTION TO OPTIMAL CONTROL AND NONLINEARCONTROL 6 Hours

Performance Indices.Regulator problem, Tracking Problem.Nonlinear system–Basic concepts and analysis.

TEXT BOOKS

1 M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2 K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
3 I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009

References

1 B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.

CourseCoordinator HOD

U18PCEE503	**ELECTRICAL MACHINE DESIGN**		**L**	**T**	**P**	**C**
	Total Contact Hours – 60		3	1	0	4
	Prerequisite – Electrical Machines – I & II					
	Course Coordinator: Mrs.AnithaSampathkumar. Department:-EEE					
	COURSE OBJECTIVES To provide sound knowledge about constructional details and design of various electrical machines.					
	COURSE OUTCOMES (COs)					
CO1	R	Remember the basic concepts in electrical machine design				
CO2	U	Understand and gain knowledge about Sizing of a transformer and temperature rise in transformers, Induction Motors and leakage reactance of polyphase machines, Sizing of a synchronous machine				
CO3	A	Apply design procedure applicable to various electrical machines.				

CO4	An	Analyze the design procedure for various electrical machines in Computer aidedDesign (CAD
CO5	Ev	Evaluate the various parameters of electrical utilities.
CO6	C	Create various Electrical machines parts in Computer aidedDesign (CAD

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	2	1	3		1			1	1		1		3	2
	CO2	2	1	3		1			1	1		1	2	3	2
	CO3	2	1	3		1			1	1		1		3	2
	CO4	2	1	3		1			1	1		1		3	2
	CO5		2								2				
	CO6	2	1	3		1			1	1		1	3	3	1
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)		
							PC								
4	Approval														

OBJECTIVES To provide sound knowledge about constructional details and design of various electrical machines.

SYLLABUS

UNIT I INTRODUCTION 12 Hours

Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

UNIT II TRANSFORMERS 12 Hours

Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

UNIT III INDUCTION MOTORS 12 Hours

Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design

of wound rotor, magnetic leakage calculations, leakage reactance of polyphase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT IV SYNCHRONOUS MACHINES 12 Hours

Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

UNITV COMPUTER AIDED DESIGN (CAD) 12 Hours

Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to **c**omplex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

TEXT BOOKS

1. A. K. Sawhney, "A Course in Electrical Machine Design", DhanpatRai and Sons, 1970.
2. M.G. Say, "Theory & Performance & Design of A.C. Machines", ELBS London.

REFERENCES

1. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.

CourseCoordinator HOD

U18PCEE504		**MEASUREMENT AND INSTRUMENTATION**	**L**	**T**	**P**	**C**
		Total Contact Hours – 45	3	0	0	3
		Prerequisite – Basics of Electrical and Electronic Systems				
		Course Coordinator : Dr.T.R.Rangaswamy Department:-EEE				
COURSE OBJECTIVES To understand the fundamental concepts of measuring systems and instruments.						
COURSE OUTCOMES (COs)						
CO1	R	To recall the various electrical and non-electrical parameters and their characteristics.				
CO2	U	To understand the working and functions of Transducers, advanced sensors and amplifier				
CO3	A	To Apply knowledge and handle instruments for measurement of Electrical, Optical, Thermal and Mechanical quantities.				
CO4	An	To Analyze the functioning of Electrical measurements and telemetry.				

CO5	Ev	To Evaluate signal conditioning methods for input, output and monitoring of various devices.
CO6	C	To design different sensors and devices for industrial application

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	3		3		2		1			1		3	
	CO2	3		3	3		2					1		3	
	CO3	3	3		3		2					1	3	3	
	CO4	3	3		3		2					1		3	
	CO5	3			3		2					1		3	
	CO6			2			1				1				

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

SYLLABUS

UNITI INTRODUCTION **9 Hours**

Functional elements of measurement system – static characteristics – static calibration – accuracy, precision, resolution, linearity, dynamic, characteristics – performance characteristics of zero first, second order system – error in measurement.

UNIT II SENSORS AND TRANSDUCER **9 Hours**

Basic requirement of sensors – classification of sensors – resistive, inductive and capacitive transducers –LVDT, piezoelectric, thermoelectric, optical and digital transducer – transducers application in force, torque, level, flow, pressure, speed, and temperature measurement – PH electrode – photoelectric transducer.

UNIT III SIGNAL CONDITIONING SYSTEM **9 Hours**

Bridges – instrumentation amplifier – operational amplifier – buffer amplifier – differential amplifier – active filter, V/F and F/V converters, PLL, sample and hold circuit, A/D and D/A converters, function generators, multiplexing and de-multiplexing system, data acquisition system.

UNIT IV ELECTRICAL AND ELECTRONICS MEASUREMENT AND TELEMETRY 9 Hours

Principle of ammeter and voltmeter – digital voltmeter – energy meter – wattmeter – current – voltage and position telemetry system – AC telemetry – wattmeter – current, voltage and position telemetry system – AC system

UNIT V INPUT – OUTPUT DEVICES AND DISPLAYS 9 Hours

Seven segment display – LED, LCD, mixie tube, alphanumeric display – CRT, CRO – Magnetic tape recorder – digital printer – X-Y recorder .

TEXT BOOKS

1. Doebeline, E.O., "Measurement Systems – Application and Design", McGraw Hill Publishing compeney, 1990.
2. Dalley, J.W. Riely, W.F and Meconnel, K.G., "Instrumentation for Engineering Measurement", John Wiley & Sons, 1993 J.B Gupta, Measurements and Instrumentation".

REFERENCE BOOKS

1. Stout M.B., 'Basic electric Measurement, Prentice Hall of India. 1986
2. H.S. Kalsi, "Electronic instrumentation", Tata McGraw Hill Co., 1995.
3. Shawney A.K., "Electronic Instrumentation", DhanpatRai& Sons, New Delhi,2008.
4. Moorthy.D.V.S,"Transducers and Instrumentation", Prentice Hall of India Pvt Ltd 1995

CourseCoordinator HOD

U18MCTH502	**CONSTITUTION OF INDIA**		**L**	**T**	**P**	**C**
	Total Contact Hours – 24		2	0	0	0
	Prerequisite – NIL					
	Course Coordinator : Department:- AICTE					
COURSE OBJECTIVES Students will be able to: • Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective. • To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism. • To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.						
COURSE OUTCOMES (COs)						
CO1	R	Remember the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.				
CO2	U	Understand the intellectual origins of the framework of argument that informed the				

		conceptualization of social reforms leading to revolution in India.
CO3	A	Relatephilosophy of the Indian Constitution
CO4	An	To discuss about the passage of the Hindu Code Bill of 1956.
CO5	Ev	Evaluate the concept of administration and election commission.
CO6	C	Action plan for Organsation of Governance

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3					3					3		3	3
	CO2		3		2					3				2	3
	CO3														
	CO4			3	3							3		2	3
	CO5							2						2	3
	CO6	3	2	2								2			

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
									MC	
4	Approval									

SYLLABUS

UNIT I **4 Hours**

History of Making of the Indian Constitution**:** History Drafting Committee, (Composition& Working)

UNIT II **4 Hours**

Philosophy of the Indian Constitution: Preamble, Salient Features

UNIT III **4Hours**

Contours of Constitutional Rights &Duties: Fundamental Rights**,** Right to Equality**,** Right to Freedom**,** Right against Exploitation**,** Right to Freedom of Religion**,** Cultural and Educational

Rights,Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV **4 Hours**

Organsation of Governance: Parliament, Composition**,** Qualifications and Disqualifications**,** Powers and FPhilosophy of the Indian Constitution: Preamble, Salient Features unctions**,** Executive**,** President**,** Governor**,** Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V **4 Hours**

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of ElectedRepresentativeCEO of Municipal Corporation.Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT VI **4 Hours**

Election Commission**:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning.Institute and Bodies for the welfare of SC/ST/OBC and women.

SUGGESTED READING

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7thEdn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

CourseCoordinator HOD

U18PCEE5L1	**POWER SYSTEMS – I LABORATORY**		**L**	**T**	**P**	**C**
	Total Contact Hours – 30		0	0	3	1.5
	Prerequisite –Basic Electrical and Electronics Engineering					
	Course Coordinator : Dr.V.Jayalakshmi Department:- EEE					
COURSE OBJECTIVES ➢ To address the underlying concepts & approaches behind analysis of power system network using software tools. ➢ To identify & formulate solutions to problems relevant to power system using Software tools.						
COURSE OUTCOMES (COs)						
CO1	R	Recall the principles and approaches behind the power system				
CO2	U	To understand the Modeling of a Wind Turbine System and HVDC Transmission Line Analyzer				
CO3	A	To Apply the I-V and P-V characteristics of series and parallel combination of PV				
		modules.				

CO4	An	To analyze the Equivalent circuit of a 3-winding transformer, Per-unit calculations, Three phase short circuit analysis in a Synchronous Machine
CO5	Ev	To Evaluate Symmetrical components of a set of Unbalanced currents and original unbalanced phase voltages from Symmetrical Components
CO6	C	Design a model for the application of renewable energy resources.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3				2			2						
	CO2	2	3			1	1		2	2		3		3	2
	CO3	2	3			1	1		2	2		3	2	3	2
	CO4	2	3			1	1		2	2		3		3	2
	CO5	3	3			1	1		2	2		3		3	2
	CO6				3		2								

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

SYLLABUS

List of Experiments

1. Voltage Regulation ofa Medium Line Model
2. Calculation of ABCD Parameters for Short, Medium and Long Transmission Lines.
3. Determination of Equivalent circuit of a 3-winding transformer.
4. Per-UNIT calculations
5. Three phase short circuit analysis in a Synchronous Machine
6. Unsymmetrical Fault Analysis

7.a) Obtain Symmetrical components of a set of Unbalanced currents

b) Obtain the original unbalanced phase voltages from Symmetrical Components

8. To demonstrate the I-V and P-V characteristics of series and parallel combination of PV modules
9. To demonstrate HVDC Transmission Line Analyzer
10. Modeling of a Wind Turbine System

CourseCoordinator HOD

U18PCEE5L2	CONTROL SYSTEMS LABORATORY	L	T	P	C
	Total Contact Hours – 30	0	0	3	1.5
	Prerequisite – Engineering Mathematics, Electrical Circuit Analysis				
	Course Coordinator : Ms.G.Hemavathy Department:- EEE				

COURSE OBJECTIVES

To introduce control system lab experiments using hardware and software tools which provide path towards the engineering applications.

COURSE OUTCOMES (COs)

CO1	R	To Remember the basic concepts of control system concept of AC/DC servo motor to compute the transfer function.
CO2	U	To understand the impact of P. PI &PID controllers on linear system.
CO3	A	To Apply the design concept in lead & Lag compensators and closed loop control system
CO4	An	To analyze the Synchro Transmitter and Receiver characteristics.
CO5	Ev	compare the different controller and compensator techniques and find best application
CO6	C	To Create Bode, Root Locus, Nyquistplots , using Mat lab software for control system application.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	2	3			1	1		2	2		3		3	2
	CO2	2	3			1	1		2	2		3		3	2
	CO3	2	3			1	1		2	2		3		3	2
	CO4	3	3			1	1		2	2		3		3	2
	CO5				3							2			
	CO6	2	3			1	1		2	2		3		3	2

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

SYLLABUS

LIST OF EXPERIMENTS

1. Determination of transfer function parameters of a DC servo motor.
2. Determination of transfer function parameters of AC servo motor.
3. Effect of P, PI and PID controllers on second order system.
4. Digital simulation of linear systems
5. Design of lag and lead compensators.
6. Closed loop control system
7. Stability analysis of linear systems.
8. Synchro Transmitter and Receiver characteristics.
9. MATLAB programming
   a. Determination of Transfer function from poles and zeros.
   b. Determination of Poles and zeros from transfer function.
   c. Step and ramp response of first order system.
10. Simulation of second order system using MATLAB
11. Bode, Root Locus, Nyquist plots of Linear Time Invariant system using MATLAB.

CourseCoordinator HOD

U18PCEE5L3	**MEASUREMENT AND INSTRUMENTATION LABAROTARY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	0	0	3	1.5
	Prerequisite – Basic Electrical & Electronics Engineering				
	Course Coordinator : Dr.K.SakthivelDepartment:- EEE				

COURSE OBJECTIVES

To acquire skills on using different measuring devices.

COURSE OUTCOMES (COs)

CO1	R	To remember the basic bridge technique for measurement of inductance, capacitance and resistance.

CO2	U	To understand the calibration of energy meter
CO3	A	To Apply the skill of measurement of temperature, pressure and torque using transducers.
CO4	An	To analyze the waveforms using DSO, the AC and DC bridges
CO5	Ev	Evaluate the bridge circuit with different parameters
CO6	C	Construct a new mechanism using various parameters and conditions

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	3		3		2		1			1		3	
	CO2	3		3	3		2					1	2	3	
	CO3	3	3		3		2					1		3	
	CO4	3	3		3		2					1		3	
	CO5				3							2			
	CO6	2	3			1	1		2	2		3		3	2

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

SYLLABUS

LIST OF EXPERIMENT

1. Measurement of a batch of resistors and estimating statistical parameters.
2. Measurement of L using a bridge technique as well as LCR meter.
3. Measurement of C using a bridge technique as well as LCR meter
4. Measurement of L using a bridge technique as well as LCR meter.
5. Measurement of C using a bridge technique as well as LCR meter.
6. Measurement of Low Resistance using Kelvin's double bridge.
7. Measurement of High resistance and Insulation resistance using Megger.
8. Measurement of temperature using thermocouple and RTD.
9. Measurement of displacement using LVDT
10. Design of Instrumentation amplifiers.

11. Measurement of Torque and angle.
12. Calibration of single phase energy meter
13. Usage of DSO for steady state periodic waveforms produced by a function generator. Selection of trigger source and trigger level, selection of time-scale and voltage scale. Bandwidth of measurement and sampling rate.
14. Download of one-cycle data of a periodic waveform from a DSO and use values to compute the RMS values using a C program.
15. Usage of DSO to capture transients like a step change in R-L-C circuit.
16. Current Measurement using Shunt, CT, and Hall Sensor.

CourseCoordinator HOD

SEMESTER VI

U18PCEE601		**POWER SYSTEMS – II (OPERATION AND CONTROL)**										**L**	**T**	**P**	**C**
		Total Contact Hours – 45										3	0	0	3
		Prerequisite – Power System -I													
		Course Coordinator : Dr.V.Jayalakshmi Department:-EEE													
COURSE OBJECTIVES To gain fundamental knowledge of power system operation and its Control using various devices.															
COURSE OUTCOMES (COs)															
CO1	R	Remember the concepts of synchronous grid,													
CO2	U	Understand the structure of a Power System and techniques to control power flows, frequency and voltage.													
CO3	A	Apply numerical methods to analyze a power flow system.													
CO4	An	Analysis of Power Flows, swing equation etc. Learn & analyze the Security Analysis, Contingency Analysis.													
CO5	Ev	Evaluate Computational Issues in Power Systems.													
CO6	C	Perform system state estimation and explore its importance.Planning to implement the optimalunit commitment (UC) undervarious conditions.													
Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	2	3	3		2			3	2		2	2	2	3
	CO2	3	3	3		2			3	2		2		2	3

	CO3	2	3	3		2			3	2		2		2	3
	CO4	2	3	3		2			3	2		2		2	3
	CO5	3	3	3		2			3	2		2		2	3
	CO6		3	3		2			3	2		2	3	2	3
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)					
					PC										
4	Approval														

SYLLABUS

UNIT I POWER FLOW ANALYSIS 9 Hours

Review of the structure of a Power System and its components. Analysis of Power Flows: Formation of Bus Admittance Matrix. Real and reactive power balance equations at a node. Load and Generator Specifications.Application of numerical methods for solution of non-linear algebraic equations – Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations.Computational Issues in Large-scale Power Systems.

UNIT II STABILITY CONSTRAINTS IN SYNCHRONOUS GRIDS 9 Hours

Swing Equations of a synchronous machine connected to an infinite bus. Power angle curve.Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three--phase fault.Analysis using numerical integration of swing equations (using methods like Forward Euler, Runge-Kutta 4^{th} order methods), as well as the Equal Area Criterion.Impact of stability constraints on Power System Operation.Effect of generation rescheduling and series compensation of transmission lines on stability.

UNIT III CONTROL OF FREQUENCY AND VOLTAGE 9 Hours

Turbines and Speed-Governors, Frequency dependence of loads, Droop Control and Power Sharing.Automatic Generation Control.Generation and absorption of reactive power by various components of a Power System. Excitation System Control in synchronous generators, Automatic Voltage Regulators. Shunt Compensators, Static VAR compensators and STATCOMs. Tap Changing Transformers.Power flow control using embedded dc links, phase shifters and

UNIT IV MONITORING AND CONTROL 9 Hours

Overview of Energy Control Centre Functions: SCADA systems. Phasor Measurement UNITs and Wide-Area Measurement Systems.State-estimation.System Security Assessment. Normal, Alert, Emergency, Extremis states of a Power System. Contingency Analysis.Preventive Control and Emergency Control.

UNIT V POWER SYSTEM ECONOMICS AND MANAGEMENT 9 hours

Basic Pricing Principles: Generator Cost Curves, Utility Functions, Power Exchanges, Spot Pricing. Electricity Market Models (Vertically Integrated, Purchasing Agency, Whole-sale competition, Retail Competition), Demand Side-management, Transmission and Distributions charges, Ancillary Services.Regulatory framework.

TEXT BOOKS

1. Olle I. Elgerad, "Electric Energy System Theory and Introduction", Tata McGraw Hill publishing company, New Delhi, 2nd edition, 2004.
2. Allen J.Wood, Bruce F. Wallenberg, "Power Generation, operation and control", 2nd edition, John Wiley and sons, 2008.

REFERENCE BOOKS

1. D.P.Kothari and I.J.Nagrath, " Modern Power System Analysis" Tata McGraw Hill publishing company Ltd., 2003.
2. PrabhaKundur, "Power System Stability and Control" Tata McGraw Hill publishing company Ltd., 2006.
3. A.K.Mahalanbias, D.P.Kothari&S.I.Ahson, "Computer Aided Power System Analysis and Control" Tata McGraw Hill publishing company, New Delhi, 1990.
4. P.S.R. Murty, "Operation and Control in Power Systems" BS Publications, 2005.

CourseCoordinator HOD

U18PCEE602	**MICROPROCESSOR & MICROCONTROLLER**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Digital Electronics				
	Course Coordinator : Dr.S.P.Vijayaragavan Department:-EEE				

COURSE OBJECTIVES An **a**bility to understand the assembly language programming, interfacing Design of peripherals like I/O, A/D, D/A, timer etc. Develop systems using Different microcontrollers.

COURSE OUTCOMES (COs)

CO1	R	Remember embedded system& its features
CO2	U	Understand the concept of Microprocessors, Microcontroller(8051) and its peripheral interfacing.
CO3	A	Apply knowledge and demonstrate programming proficiency using the various addressing Modes and data transfer instructions of the target microprocessor and microcontroller.
CO4	An	Analyze microcontroller based system design for various applications.
CO5	Ev	Evaluate the accepted standards and guidelines to select appropriate Microprocessor and Microcontroller to meet specified performance requirements
CO6	C	Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-

	Medium, 1-Low														
1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	2	2	2	2	1	1		1	1		2		3	2
	CO2	2	2	2	2				1	1		2	3	3	2
	CO3	1	2	3	1				3	2		1		3	2
	CO4	1	2	3	1		1		3	2	2	1		3	2
	CO5	1	1	1	1				2	1		1		3	2
	CO6	1	2	3	1				3	2		1	3	3	2
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Any other		Project/Term Paper/ Seminar/ Internship(PR)	
							PC								
4	Approval														

SYLLABUS

UNIT I FUNDAMENTALS OF MICROPROCESSORS 7 Hours

Fundamentals of Microprocessor Architecture.8-bitMicroprocessor and Microcontrollerarchitecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers.Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems.Overview of the 8051 family.

UNIT II THE 8051 ARCHITECTURE 8 Hours

Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

UNIT III INSTRUCTION SET AND PROGRAMMING 8 Hours

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers.Programming and debugging tools.

UNIT IV MEMORY AND I/O INTERFACING 8 Hours

Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, and memory devices.

UNIT V EXTERNAL COMMUNICATION INTERFACE 6 Hours

Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.

UNIT VI APPLICATIONS 8 Hours

LED, LCD and keyboard interfacing.Stepper motor interfacing, DC Motor interfacing, and sensor interfacing, waveform generation.

TEXT BOOKS

1. M .A.Mazidi, J. G. Mazidi and R. D. McKinlay, "The8051Microcontroller and Embedded Systems: Using Assembly and C",Pearson Education, 2007.
2. K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning,2004.
3. R. Kamal, "Embedded System", McGraw Hill Education,2009.
4. R. S. Gaonkar, ", Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing, 1996

REFERENCES

1. D. A. Patterson and J. H. Hennessy, "Computer Organization and Design: The Hardware/Software interface", Morgan Kaufman Publishers, 2013.
2. D. V. Hall, "Microprocessors & Interfacing", McGraw Hill Higher Education, 1991.

CourseCoordinator HOD

U18PCEE603	FUZZY LOGIC AND NEURAL NETWORK	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Engineering Mathematics II				
	Course Coordinator : Dr.T.R.Rangaswamy Department:-EEE				

COURSE OBJECTIVES To master the various fundamental concepts of fuzzy logic and artificial neural networks. This will help you to get sufficient knowledge to analyze and design the various intelligent control systems.

COURSE OUTCOMES (COs)

CO1	R	Comprehend the fuzzy logic and the concept of fuzzinessinvolved in various systems and fuzzy set theory
CO2	U	Understand appropriate learning rules for each of the architectures.
CO3	A	Applying several neural network paradigms.Apply the conceptual things to the real world Electrical and electronics problems and applications.
CO4	An	Analysis of Competitive and Special Neural Networks

CO5	Ev	Describe the artificial intelligent techniques and interprets its data
CO6	C	Develop some familiarity with current research problems and research methods in fuzzy and neural Techniques.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

		PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3	3	3	3	3	3	3	3		3	1		3	3
	CO2		3	3	3	3		3	3	3	3	1		3	
	CO3		3			3	3	1	3	3		1	3	3	
	CO4		3	3		3	3	1	3	3	1	3		3	
	CO5				3							3			
	CO6	3	3	3	3	3		3				1	3	1	3

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

SYLLABUS

UNITI FUNDAMENTALS OF FUZZY LOGIC 9 Hours

Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets- complements-union- intersection- combination of operation- general aggregation operations- fuzzy relations-compatibility relations-orderings- morphisms- fuzzy relational equations-fuzzy set and systems

UNITII ARCHITECTURE OF NEURAL NETWORKS 9 Hours

Architectures: motivation for the development of natural networks-artificial neural networks-biological neural networks-area of applications-typical Architecture-setting weights-common activations functions- Basic learning rules- McGulloch-Pitts neuron- Architecture, algorithm, applications-single layer net for pattern classification- Biases and thresholds, linear separability - Hebb'srule- algorithm -perceptron - Convergence theorem-Delta rule

UNIT III BASIC NEURAL NETWORK TECHNIQUES 9 Hours

Back propagation neural net:standard back propagation-architecture algorithm- derivation of learning rules-number of hidden layers--associative and other neural networks- hetro associative memory neural net, auto associative net- Bidirectional associative memory-applications-Hopfield nets-Boltzman machine

UNIT IV COMPETITIVE NEURAL NETWORKS 9 Hours

Neural network based on competition: fixed weight competitive nets- Kohonenself organizing maps and applications-learning vector quantization-counter propagation nets and applications adaptive resonance theory: basic architecture and operation-architecture, algorithm, application and analysis of ART1 & ART2

UNIT V SPECIAL NEURAL NETWORKS 9 Hours

Cognitron and Neocognitron- Architecture, training algorithm and application-fuzzy associate memories, fuzzy system architecture- comparison of fuzzy and neural systems

TEXT BOOKS:

1. Kliryvan- Fuzzy System & Fuzzy logic Prentice Hall of India, First Edition.
2. Lawrence Fussett- fundamental of Neural network Prentice Hall , First Edition.

REFERENCEBOOKS:

1. Bart Kosko, "Neural network and Fuzzy System" - Prentice Hall-1994
2. J.Klin and T.A.Folger, "Fuzzy sets" University and information- Prentice Hall -1996
3. J.M.Zurada, "Introduction to artificial neural systems"-Jaico Publication house,Delhi 1994
4. VallusuRao and HayagvnaRao , "C++ Neural network and fuzzy logic"-BPB and Publication, New Delhi,1996

CourseCoordinator HOD

U18PCEE6L1	**POWER SYSTEMS-II LABORATORY**		**L**	**T**	**P**	**C**
	Total Contact Hours – 30		0	0	3	1.5
	Prerequisite – Power system-I Laboratory					
	Course Coordinator : Dr.V.Jayalakshmi Department:- EEE					
COURSE OBJECTIVES						
➢ To enhance the practical knowledge on power systems through simulation of load flow, economic load dispatch etc. using various soft ware's like ETAP, MATLAB etc.						
COURSE OUTCOMES (COs)						
CO1	R	Understand and remember the parameters of the Power System Network				
CO2	U	Experiment with the basic load flow analysis methods				
CO3	A	Apply the load flow technique with different methods(Newton Raphson, Gauss – seidel, Fast decoupled).				
CO4	An	Analyze the load frequency control of various network systems				
CO5	Ev	Evaluate the load flow, optimal dispatchusing MATLAB software.				
CO6	C	Formulate the bus impedance &admittance matrix by different transformation method.				

	Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low														
1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	3				2			2						
	CO2	2	3			1	1		2	2		3		3	2
	CO3	2	3			1	1		2	2		3	2	3	2
	CO4	2	3			1	1		2	2		3		3	2
	CO5	3	3			1	1		2	2		3		3	2
	CO6				3		2								
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)			
											PC				
4	Approval														

LIST OF EXPERIMENTS FOR POWER SYSTEMS-II LAB

1. Formulation of the bus admittance matrix by direct inspection and SingularTransformation method.
2. Formation of bus impedance matrix by direct inspection and SingularTransformation method.
3. Load Flow studies by Gauss – seidelmethods
4. Load Flow studies by Newton Raphson methods.
5. Load Flow studies by Fast decoupled methods.
6. Numerical Integration of Swing equation.
7. The Equal-Area Criterion.
8. Economic/Optimal Load Dispatch.
9. Load Frequency Control

CourseCoordinator HOD

U18PCEE6L2	MICROPROCESSORS&MICROCONTROLLERS LABORATORY	L	T	P	C
	Total Contact Hours – 30	0	0	3	1.5
	Prerequisite – Digital Electronics				
	Course Coordinator : Dr.S.P.Vijayaragavan Department:- EEE				

COURSE OBJECTIVES

- To gain knowledge in programming microprocessor and microcontroller and to learn about various Interfacing concepts.

COURSE OUTCOMES (COs)

CO1	R	Remember the instruction set, addressing modes of microprocessor and microcontroller
CO2	U	Understand the basic concepts of ALP.
CO3	A	Apply the assembly level programming for real time projects.
CO4	An	Analyzing ability to compare Processor & Controller.
CO5	Ev	Designing Mini projects with processors & controllers.
CO6	C	To Develop an ability in interfacing a microprocessor and microcontroller with electrical and electronic systems

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1	2	3	1					2	2		3		3	2
	CO2	2	3	1					2	2	2	3		3	2
	CO3	2	3	1	1				2	2		3	3	3	2
	CO4	2	3	1		1			2	2		3		3	2
	CO5	2	3	1					2	2		3	3	3	2
	CO6				3		2				2				

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
									PC	
4	Approval									

LIST OF EXPERIMENTS:

8085 Programming

1	(a)	8 bit Addition.	(b)	8 bit Subtraction.
2	(a)	Multiplication.	(b)	Division.
3	(a)	16 bit Addition	(b)	16 bit Subtraction.
4	(a)	Largest Element in an array.	(b)	Smallest Element in an array.
5	(a)	Ascending order.	(b)	Descending order.

8085 Interfacing

6. Traffic Light control
7. Keyboard Interface.
8. 8251 USART interface

8051 Programming

1. Demonstration of basic instructions with 8051 micro controller execution including Conditional jumps, looping and calling subroutines.

8051 Interfacing

10. Stepper motor control.
11. A/D & D/A Interface.
12. Waveform Generation

CourseCoordinator HOD

SEMESTER VII

U18PCEE701	**SMART GRID**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Power Systems-I				
	Course Coordinator : Dr.S.Prakash Department:-EEE				

COURSE OBJECTIVES To enable the students acquire knowledge on smart grid, different options of architectural design and communication technology for various aspects of smart grid , System analysis and stability analysis in smart grid, renewable energy sources and storage integration with smart grid.

COURSE OUTCOMES (COs)

CO1	R	Remember the concepts and design of Smart grid
CO2	U	Understand the various communication and measurement technologies in smart grid.
CO3	A	Apply the smart grid integration technologies in real time
CO4	An	Analyzethe stability of smart grid.
CO5	Ev	Evaluate the high performance computing techniques for Smart Grid applications
CO6	C	Compiles different smart grid technologies and Summaries it

	Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low														
1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1		2	2		2				2	3	2		3	3
	CO2	3	2	2							3	2	3	3	3
	CO3	3	2	2							3	2		3	3
	CO4		3	3	2	2	1			2		1		3	3
	CO5		3	3	2								3	3	3
	CO6				2										

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
					PC					
4	Approval									

SYLLABUS

UNIT I INTRODUCTION TO SMART GRID 9 Hours

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Concept of Resilient &Self-Healing Grid, Present development & International policies in Smart Grid, Diverse perspectives from experts and global Smart Grid initiatives.

UNIT II SMART GRID TECHNOLOGIES 9 Hours

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAr control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

UNITIII SMART METERS 9 Hours

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement UNIT(PMU), Intelligent Electronic Devices(IED) & their application for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID 9 Hours

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNIT V HIGH PERFORMANCE COMPUTING 9 Hours

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN),Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TEXT BOOK:

1. Vehbi C. Güngör, DilanSahin, TaskinKocak, SalihErgüt, ConcettinaBuccella, Carlo Cecati, and Gerhard P. Hancke, Smart Grid Technologies: Communication Technologies and Standards IEEE Transactions On Industrial Informatics, Vol. 7, No. 4, November 2011.

REFERENCES

1. Xi Fang, SatyajayantMisra, GuoliangXue, and Dejun Yang *"*Smart Grid – The New and Improved Power Grid: A Survey" , IEEE Transaction on Smart Grids, 2011.
2. Stuart Borlase "Smart Grid :Infrastructure, Technology and Solutions",CRC Press 2012.
3. https://www.youtube.com/watch?v=JwRTpWZReJk&list=PLzcxA4YJjE1s6NOlhCA34vrsFCeokjs9_
4. https://iit.edu/news/iittoday/?tag=smart-grid

CourseCoordinator HOD

U18MCTH701	**ESSENCE OF INDIA KNOWLEDGE TRADITION**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	2	2	0	0
	Prerequisite – NIL				
	Course Coordinator : Department:-EEE				

Objective:

- It will also focus on Indian philosophical, linguistic and artistic traditions, along with yoga and Indian perspective of modern scientific worldview.
- The course aims at imparting basic principles of thought process, reasoning and inferencing.

CourseCoordinator HOD

U18PCEE7L1	Electronics Design Lab	L	T	P	C
	Total Contact Hours – 30	0	0	4	2

Prerequisite – Analog Electronics Circuits, Digital Electronics, Power Electronics

Course Coordinator : Dr.S.Prakash & Dr. T.R.Rangaswamy
Department:- EEE

COURSE OBJECTIVES

To enhance the practical knowledge on Electronic Design for Industrial Applications through experiments and simulations

➢

COURSE OUTCOMES (COs)

CO1	R	To recall the concept of Digital & Analog Electronics
CO2	U	To interpret and understand the Power Electronics Components
CO3	A	To classify analog and digital electronics components
CO4	An	To differentiate real time and simulation of Electronic Design applications
CO5	Ev	Choose appropriate components, software and hardware platforms
CO6	C	To Develop an electronic systems and interface with microprocessor / microcontroller

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low

1	COs/Pos	PO1	2	3	4	5	6	7	8	9	10	11	12	PSO	PSO
2	CO1		3	3	1	1				2		3		3	2
	CO2		3	2	1					2		3		3	2
	CO3		3	3	1					2		3	3	3	2
	CO4		3	2	1	1				2		3		3	2
	CO5		3	2	2					2		3	3	3	2
	CO6		3	3	2	1				2		3	3	3	3

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Any other	Project/Term Paper/ Seminar/ Internship(PR)
									PC	

4	Approval	

LIST OF EXPERIMENTS:(Selection Based)

1

a. Design of IGBT based single phase PWM inverter.
b. Design IGBT based three phase PWM inverter.
c. Design if Single Phase AC Voltage controller with R & RL Load.
d. Design and Simulation of dc-dc converters.
e. Design of Switched Mode Power Supply.
f. Design DSP based Stepper Motor Controller using 8051 Micro-controller.

2. Programmable logic Controller (PLC) design
3. Analog and digital system design and analysis
4. Computer aided design and simulation
5. Electrical substation design
6. Design of Automation and control of Industrial process
7. Design of signal conditioning circuits;
8. Group projects involving electronic hardware (Analog, Digital, mixed signal) leading to implementation of an application

Course Coordinator HOD

LIST OF ELECTIVES

PROGRAM ELECTIVE –1

U18PEEE11	**Power System Protection**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Power System-I				
	Course Coordinator Dr.V. Jayalakshmi. Department:EEE				

OBJECTIVES To understand the analysis of Transmission Line and Wave Propagation at different Load conditions.		
COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	To Remember the components used in protection system.
CO2	U	To understand the principle of different components of a protection system and fault current due to different types of fault in a network and over current protection
CO3	A	To Apply protection schemes in the power systems.
CO4	An	To Analyze the Modeling and Simulation of Protection Schemes
CO5	E	Evaluate of components used for power system protection
CO6	C	Design Digital protection system using software tool

SYLLABUS

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO2
2	CO1		2	1		2			3	3		3		1	2
	CO2			2		1			2	3	1			1	2
	CO3				2		2							1	2
	CO4		1	1		2					2		2	1	2
	CO5			1	1		2					2		1	2
	CO6		2	1		2			3	3		3	1	1	2
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

UNIT I Introduction and Components of a Protection System 9 Hours

Principles of Power System Protection, Relays, Instrument transformers, Circuit Breakers

UNIT II Faults and Over-Current Protection 9 Hours

Review of Fault Analysis, Sequence Networks. Introduction to Over current Protection and over current relay co-ordination.

UNIT III Equipment Protection Schemes 9 Hours

Directional, Distance, Differential protection.Transformer and Generator protection. Bus bar Protection, Bus Bar arrangement schemes.

UNIT IV Digital Protection 9 Hours

Computer-aided protection, Fourier analysis and estimation of Phasors from DFT. Sampling, aliasing issues.

UNIT V Modeling and Simulation of Protection Schemes 9 Hours

CT/PT modeling and standards, Simulation of transients using Electro-Magnetic Transients (EMT) programs. Relay Testing.

UNIT VI System Protection 9 Hours

Effect of Power Swings on Distance Relaying.System Protection Schemes. Under-frequency, under-voltage and df/dt relays, Out-of-step protection, Synchro-phasors, Phasor Measurement Units and Wide-Area Measurement Systems (WAMS). Application of WAMS for improving protection systems.

Text

1. A. G. Phadke and J. S. Thorp, "Computer Relaying for Power Systems", John Wiley & Sons, 1988.
2. A. G. Phadke and J. S. Thorp, "Synchronized Phasor Measurements and their Applications", Springer, 2008.
3. D. Reimert, "Protective Relaying for Power Generation Systems", Taylor and Francis, 2006.

References

1 J. L. Blackburn, "Protective Relaying: Principles and Applications", Marcel Dekker, New York, 1987.

2. Y. G.Paithankar and S. R. Bhide, "Fundamentals of power system protection", Prentice Hall, India, 2010.

3. Intelligent Systems and Control-http://nptel.ac.in/courses/108104049/16

U18PEEE12	**Line-Commutated and Active PWM Rectifiers**	**L**	**T**	**P**	**C**
	Total Contact Hours – 40	3	0	0	3
	Prerequisite – Power Electronics				
	Course Coordinator – Ms.S.Sherine ,Department: EEE				

OBJECTIVES

- At the end of this course, students will demonstrate the ability to Analyse controlled rectifier circuits.
- Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations regeneration modes and lagging, leading and unity power factor.
- Understand the operation of PWM rectifiers – operation in rectification and mode.

COURSE OUTCOMES (COs)

CO1	R	To remember thediode, thyristor and converters.
CO2	U	To understand the operation of rectifier circuits.
CO3	A	To apply the power devices in drives.
CO4	An	To analyze about the converter operations.
CO5	E	To evaluate the rectification and regeneration modes in PWM rectifiers
CO6	C	To create the phasordiagramsand closed-loop control structure.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	g	H	i	j	k	l	PSO1	PSO2
2	CO1		2	2								2		2	1
	CO2		2	2								2		2	1
	CO3		2	2								2	1	2	1
	CO4		2	2								2		2	1
	CO5		2	2								2		2	1
	CO6		2	2								2		2	1
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

SYLLABUS

UNIT 1 Diode rectifiers with passive filtering 6 Hours

Half-wave diode rectifier with RL and RC loads; 1-phase full-wave diode rectifier with L, C and LC filter; 3-phase diode rectifier with L, C and LC filter; continuous and discontinuous conduction, input current waveshape, effect of source inductance; commutation overlap.

UNIT II Thyristor rectifiers with passive filtering 6 Hours

Half-wave thyristor rectifier with RL and RC loads; 1-phase thyristor rectifier with L and LC filter; 3-phase thyristor rectifier with L and LC filter; continuous and discontinuous conduction, input current wave shape

.

UNIT III Multi-Pulse converter 6 Hours

Review of transformer phase shifting, generation of 6-phase ac voltage from 3-phase ac, 6-pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation.

UNIT IV Single-phase ac-dc single-switch boost converter 6 Hours

Review of dc-dc boost converter, power circuit of single-switch ac-dc converter, steady state analysis, unity power factor operation, closed-loop control structure.

UNIT V Ac-dc bidirectional boost converter 6 Hours

Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase ac-dc boost converter, steady state analysis, operation at leading, lagging and unity power factors. Rectification and regenerating modes. Phasor diagrams, closed-loop control structure.

UNIT VI Isolated single-phase ac-dc fly back converter 10 Hours

Dc-dc flyback converter, output voltage as a function of duty ratio and transformer turns ratio. Power circuit of ac-dc flyback converter, steady state analysis, unity power factor operation, closed loop control structure

Text / References

1. G. De, "Principles of Thyristorised Converters", Oxford & IBH Publishing Co, 1988.
2. J.G. Kassakian, M. F. Schlecht and G. C. Verghese, "Principles of Power Electronics", Addison-Wesley, 1991.
3. L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.
4. N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.
5. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science &Business Media, 2001.

U18PEEE13	**UTILIZATION OF ELECTRICAL ENERGY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 42	3	0	0	3
	Prerequisite – Basic Electrical and Electronics Engineering & Power system I				
	Course Coordinator : Ms. G.Hemavathy. Department:EEE				

OBJECTIVES The objective of this course is to train students on characteristics of various drives, Heating, Welding methodologies, Illumination methods and traction system

COURSE OUTCOMES (COs)		
CO1	R	To rememberabout an electrical drives & its techniques, various types of loads.
CO2	U	To understand about the different types of electric heating.
CO3	A	To apply electrical energy in electric welding's and its various methods.
CO4	An	To analyze about the basic concept of illumination, light control and its types.
CO5	E	To evaluate the basic concepts of electric drivesinelectric traction.
CO6	C	To design lighting and flood lighting requirement

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	G	h	i	j	k	l	PSO 1	PSO2
2	CO1	2				2				2		2	2	2	
	CO2					2			2	2		2		2	
	CO3					2			2	2		2		2	
	CO4					2			2	2		2		2	
	CO5					2			2	2		2		2	
	CO6	2				2			2	2		2		3	
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

SYLLABUS

UNIT I Electric Drives 12 Hours

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 II Electric Heating 12 Hours

Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.

UNIT III Electric Welding 12 Hours

Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT IV Illumination Fundamentals & Various Illumination Methods 12 Hours

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT V Electric Traction 12 Hours

System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostatic braking and regenerative braking, Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves. Calculations of tractive effort, power, specific energy consumption forgiven run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

Text Books

1. J.B. Gupta, “Utilization of Electric Power and ElectricTraction”, Kataria& Sons publishers, Delhi, IX
Edtion, 2004.(Units 1-5)
2. C.L. Wadhwa, “Generation, Distribution and Utilization ofelectrical Energy”, New Age International
(P) LimitedPublishers, 3rd Edition, 2010. (Units 1-5)

References

1. N.V. Suryanarayana, “Utilization of Electrical Powerincluding Electric drives and Electric traction”,
New AgeInternational (P) Limited Publishers, 1st Edition, 1994.
2. E. Open Shaw Taylor, “Utilization of Electric Energy”, OrientLongman, 1st Edition, 1937.

U18PEEE14	SPECIAL ELECTRICAL MACHINES	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Electrical Machines I&II				
	Course Coordinator : Dr.S.Prakash. Department: EEE				

OBJECTIVES The student gains detailed skills related to the subject of special type of electrical machines.

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	To Remember the principle of operation of synchronous reluctance motors, stepping motors, switched reluctance motors, permanent magnet brushless D.C. motors, permanent magnet synchronous motors
CO2	U	To understand construction of operation of synchronous reluctance motors, stepping motors, switched reluctance motors, permanent magnet brushless D.C. motors, permanent magnet synchronous motors
CO3	A	To demonstrate special electrical machines characteristics
CO4	An	To analyze the performance of synchronous reluctance motors, stepping motors, switched reluctance motors, permanent magnet brushless D.C. motors, permanent magnet synchronous motors.
CO5	E	To evaluate the performance of synchronous reluctance motors, stepping motors, switched reluctance motors, permanent magnet brushless D.C. motors, permanent magnet synchronous motors
CO6	C	To study the construction and design of synchronous reluctance motors, stepping motors, switched reluctance motors, permanent magnet brushless D.C. motors, permanent magnet synchronous motors

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	G	h	i	j	k	l	PSO 1	PS O2
2	CO1	2	1	1					1		3	2		1	2
	CO2	3	1	1		3	2		1		3	2		1	2
	CO3	1	2	1			3		1	2	3	2	2	1	2
	CO4	1	1	2			3		1		2	2		1	2
	CO5		1	1					1		2	2	1	1	2
3	Category	**PROGRAM ELECTIVE**(PE)													
4	Approval														

SYLLABUS

UNITI Synchronous Reluctance Motors 9 Hours

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

UNIT II Stepping Motors 9 Hours

Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor – Single and multi-stack configurations – Torque equations – Modes of excitations – Characteristics – Drive circuits – Microprocessor control of stepping motors – Closed loop control.

UNIT III Switched Reluctance Motors 9 Hours

Constructional features – Rotary and Linear SRMs - Principle of operation – Torque production – Steady state performance prediction- Analytical method -Power Converters and their controllers – Methods of Rotor position sensing – Senseless operation –Closed loop control of SRM - Characteristics.

UNIT IV Permanent Magnet Brushless D.C. Motors 9 Hours

Constructional features of PMBLDC Motor - Permanent Magnet materials – Magnetic Characteristics –Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations –Commutation - Power converters – Motor characteristics and control.

UNIT V Permanent Magnet Synchronous Motors 9 Hours

Principle of operation – Ideal PMSM – EMF and Torque equations – Armature reaction MMF – Synchronous Reactance – Sine wave motor with practical windings – Phasor diagram – Torque/speed characteristics - Power controllers - Converter Volt-ampere requirements.

TEXT BOOKS

1.T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.
2. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.
3. Venkataraman,"Special Electrical machines".

REFERENCES

1. R. Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. P.P. Aearnley, 'Stepping Motors – A Guide to Motor

PROGRAM ELECTIVE –2

U18PEEE21	**HVDC Transmission Systems**	**L**	**T**	**P**	**C**
	Total Contact Hours – 40	3	0	0	3
	Prerequisite – Power Systems – I & II				
	Course Coordinator: Dr.S. Prakash Department:EEE				

OBJECTIVES

At the end of this course, students will demonstrate the ability to understand the advantages of DC transmission over AC transmission.

COURSE OUTCOMES (COs)		
CO1	R	To remember the basics of DC power transmission.
CO2	U	To Understand the operation of Line Commutated Converters and Voltage Source Converters.
CO3	A	To demonstrate converters for HVDC system
CO4	An	To analyze the control strategies used in HVDC transmission system.
CO5	E	To evaluate the modern trends in HVDC technology.
CO6	C	To create and analyze the multi terminal DC Systems.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	G	h	i	j	k	l	PSO 1	PS O2
2	CO1		2	1	2	1	3	3				3		3	2
	CO2	2	2		1			3			3			2	1
	CO3			1	2	2		3			3		1	2	1
	CO4		2	2	2			3			3	3		2	1
	CO5	2	1	2	2							3	2	2	1
	CO6	3	2	2	2			3			3	3		3	3
3	Category	**PROGRAM ELECTIVE** (PE)													
4	Approval														

SYLLABUS

UNIT I DC Transmission Technology 4 Hours

Comparison of AC and dc Transmission (Economics, Technical Performance and Reliability).Application of DC Transmission.Types of HVdc Systems.Components of aHVdc system. Line Commutated Converter and Voltage Source Converter based systems.

UNIT II Analysis of Line Commutated and Voltage Source Converters 10 Hours

Line Commutated Converters (LCCs): Six pulse converter, Analysis neglecting commutation overlap, harmonics, Twelve Pulse Converters.Inverter Operation.Effect of Commutation Overlap.Expressions for average dc voltage, AC current and reactive power absorbed by the converters.Effect of Commutation Failure, Misfire and Current Extinction in LCC links.

Voltage Source Converters (VSCs): Two and Three-level VSCs. PWM schemes: Selective Harmonic Elimination, Sinusoidal Pulse Width Modulation. Analysis of a six pulse converter. Equations in the rotating frame. Real and Reactive power control using a VSC.

UNIT III Control of HVDC Converters 10 Hours

Principles of Link Control in aLCCHVdc system. Control Hierarchy, Firing Angle Controls– Phase-Locked Loop, Current and Extinction Angle Control, Starting and Stopping of a Link. Higher level Controllers Power control, Frequency Control, Stability Controllers.Reactive Power Control. Principles of Link Control in a VSC HVDC system: Power flow and dc Voltage Control. Reactive Power Control/AC voltage regulation.

UNIT IV Components of HVDC systems 8 Hours

Smoothing Reactors, Reactive Power Sources and Filters in LCC HVdc systems DC line: Corona Effects.Insulators, Transient Over-voltages.dc line faults in LCC systems. dc line faults in VSC systems. DC breakers.Monopolar Operation.Ground Electrodes.

UNIT V Stability Enhancement using HVDC Control 4 Hours

Basic Concepts: Power System Angular, Voltage and Frequency Stability. Powe Modulation: basic principles – synchronous and asynchronous links. Voltage Stability Problem in AC/DC systems.

UNIT V MTDC Links 4 Hours

Multi-Terminal and Multi-Infeed Systems.Series and Parallel MTDC systems using LCCs. MTDC systems using VSCs. Modern Trends in HVDC Technology.Introduction to Modular Multi-level Converters.

Text/Reference Books

1. K. R. Padiyar, "HVDC Power Transmission Systems", New Age International Publishers, 2011.
2. J. Arrillaga, "High Voltage Direct Current Transmission", Peter Peregrinus Ltd., 1983.
3. E. W. Kimbark, "Direct Current Transmission", Vol.1, Wiley-Interscience, 1971.

U18PEEE22	**Solid State DC Drives**	**L**	**T**	**P**	**C**
	Total Contact Hours – 43	3	0	0	3
	Prerequisite – Electrical Machines I, Power Electronics				
	Course Coordinator: Ms.Sherine Department:EEE				

OBJECTIVES

- To study and understand the operation of DC drives and intelligentcontroller for drives.

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Remember the characteristics of dc motors.
CO2	U	Understand the concept of converter and chopper fed drives
CO3	A	To apply the characteristics of dc motors using digital control
CO4	An	To analyze the DC Drives in closed loop control
CO5	E	To Evaluate four quadrant operations of Class A, B, C, D, E chopper
CO6	C	To design closed loop control systems

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	G	h	i	j	k	l	PSO 1	PSO 2
2	CO1		1	1					1		3	2		1	2
	CO2		1	1					1		3	2		1	2
	CO3		1	1					1		3	2	2	1	2
	CO4		1	1					1		3	2		1	2
	CO5		1	1					1		2	2	1	1	2
	CO6		2	2					2		2	2		3	3
3	Category	**PROGRAM ELECTIVE**(PE)													
4	Approval														

SYLLABUS

UNIT I DC MOTORS FUNDAMENTALS AND MECHANICAL SYSTEMS 9

DC motor- Types, induced emf, speed-torque relations; Speed control – Armature and field speed control; Ward Leonard co+ntrol – Constant torque and constant horse power operation – Introduction to high speed drives and modern drives. Characteristics of mechanical system – dynamic equations, components of torque, types of load; Requirements of drives characteristics – stability of drives – multi-quadrant operation; Drive elements, types of motor duty and selection of motor rating.

UNIT II CONVERTER CONTROL 9

Principle of phase control – Fundamental relations; Analysis of series and separately excited DC motor with single-phase and three-phase converters – waveforms, performance parameters, performance characteristics. Continuous and discontinuous armature current operations; Current ripple and its effect on performance; Operation with freewheeling diode; Implementation of braking schemes; Drive employing dual converter.

UNIT III CHOPPER CONTROL 9

Introduction to time ratio control and frequency modulation; Class A, B, C, D and E chopper controlled DC motor – performance analysis, multi-quadrant control – Chopper based implementation of braking schemes; Multi-phase chopper; Related problems.

UNIT IV CLOSED LOOP CONTROL 9

Modeling of drive elements – Equivalent circuit, transfer function of self, separately excited DC motors; Linear Transfer function model of power converters; Sensing and feeds back elements – Closed loop speed control – current and speed loops, P, PI and PID controllers – response comparison. Simulation of converter and chopper fed d.c drive.

UNIT V DIGITAL CONTROL OF D.C DRIVE 9

Phase Locked Loop and micro-computer control of DC drives – Program flow chart for constant horse power and load disturbed operations; Speed detection and current sensing circuits.

TOTAL: 45 PERIODS

REFERENCES

1. Gopal K Dubey, "Power Semiconductor controlled Drives", Prentice Hall Inc., New Yersy, 1989.
2. R.Krishnan, "Electric Motor Drives – Modeling, Analysis and Control", Prentice-Hall of India Pvt. Ltd., New Delhi, 2010.
3. GobalK.Dubey, "Fundamentals of Electrical Drives", Narosal Publishing House, New Delhi, Second Edition ,2009
4. VedamSubramanyam, "Electric Drives – Concepts and Applications", Tata McGraw-Hill publishing company Ltd., New Delhi, 2002.
5. P.C Sen "Thyristor DC Drives", John wiely and sons, New York, 1981.

U18PEEE23	**Distributed generation and Micro grid**	**L**	**T**	**P**	**C**
	Total Contact Hours – 43	3	0	0	3
	Prerequisite – Power system I & II				
	Course Coordinator: Dr.K.Sakthivel Department:EEE				

OBJECTIVES

- To illustrate the concept of distributed generation ,the impact of grid integration and concept of Micro grid and its configuration

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Remember the standards of generation and Microgrid
CO2	U	Understand the concept of distributed generation, operation and principle of micro grid
CO3	A	To apply the concept of distributed generation ,the impact of grid integration and concept of Microgrid and its configuration
CO4	An	To analyze the operation and principle of micro grid
CO5	E	To Evaluate the operation and principle of micro grid

CO6	C	To design control system for Micro Grid

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	G	h	i	j	k	l	PSO 1	PSO 2
2	CO1		1	1					1		3	2		1	2
	CO2		1	1					1		3	2		1	2
	CO3		1	1					1		3	2	2	1	2
	CO4		1	1					1		2	2		1	2
	CO5		1	1					1		2	2	1	1	2
	CO6		2	2					2		2	2	1	2	3
3	Category	**PROGRAM ELECTIVE** (PE)													
4	Approval														

SYLLABUS

UNIT I INTRODUCTION **9**

Conventional power generation: advantages and disadvantages, Energy crises, Non - conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

UNIT II DISTRIBUTED GENERATIONS (DG) **9**

Concept of distributed generations, topologies, selection of sources, regulatory standards/ framework, Standards for interconnecting Distributed resources to electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants.

UNIT III IMPACT OF GRID INTEGRATION **9**

Requirements for grid interconnection, limits on operational parameters,: voltage, frequency, THD, response to grid abnormal operating conditions, islanding issues. Impact of grid integration with NCE sources on existing power system: reliability, stability and power quality issues.

UNIT IV BASICS OF A MICROGRID **9**

Concept and definition of micro grid, micro grid drivers and benefits, review of sources of micro grids, typical structure and configuration of a micro grid, AC and DC micro grids, Power Electronics interfaces in DC and AC micro grids.

UNIT V CONTROL AND OPERATION OF MICROGRID **9**

Modes of operation and control of micro grid: grid connected and islanded mode, Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques, micro grid communication infrastructure, Power quality issues in micro grids, regulatory standards, Micro grid economics, Introduction to smartmicro grids.

REFERENCES

1. AmirnaserYezdani, and Reza Iravani, “Voltage Source Converters in Power Systems: Modeling, Control and Applications”, IEEE John Wiley Publications, 2009.

2. DorinNeacsu,"Power Switching Converters: Medium and High Power", CRC Press, Taylor & Francis, 2006.
3. Chetan Singh Solanki,"Solar Photo Voltaics", , PHI learning Pvt. Ltd., New Delhi, 2009
4. J.F. Manwell, J.G "Wind Energy Explained, Theory Design and Applications,".McGowan Wiley publication, 2nd Edition, 2009.
5. D. D. Hall and R. P. Grover,"BiomassRegenerable Energy", , John Wiley, New York, 1987.
6. John Twidell and Tony Weir, "Renewable Energy Resources", Taylor and Francis Publications, Second Edition, 2006.

U18PEEE24	MICROCONTROLLER BASED SYSTEM DESIGN	L	T	P	C
	Total Contact Hours – 43	3	0	0	3
	Prerequisite – Microprocessor & Microcontroller				
	Course Coordinator: Dr.S.P.Vijayaraghavan Department:EEE				

OBJECTIVES

To expose the students to the fundamentals of microcontroller based system design

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Remember the basics of embedded system
CO2	U	Understand about Hardware/software co-design aspects andARM Processor and programming them.
CO3	A	To apply the concept of embedded system in ARM Processor
CO4	An	To analyze various interfacing circuits necessary for various applications
CO5	E	Criticize PIC controller and Arm processor
CO6	C	To Create Hardware/software co-design aspects

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1		1	1					1		3	2		1	2
	CO2		1	1					1		3	2		1	2
	CO3		1	1					1		3	2	2	1	2
	CO4		1	1					1		2	2		1	2
	CO5		1	1					1		2	2	1	1	2
	CO6		2	2					2		2	2		3	3
3	Category	**PROGRAM ELECTIVE** (PE)													
4	Approval														

SYLLABUS

UNIT I EMBEDDED SYSTEMS 9

Introduction to embedded systems – hardware and software components –types- examples-characteristics –system on chip-challenges in embedded computing system design – embedded system design process.

UNIT II EMBEDDED SYSTEM INTERFACING 9

Serial and parallel communication devices-wireless devices – timer & counting devices-Watch dog timer – Serial communication using I2C- CAN USB buses –Parallel Communication using ISA- PCI- PCI/X buses-wireless and mobile system protocol.

UNIT III ARM PROCESSOR-7 **9**

MSP430 architecture-addressing modes-constant generator and emulsion instructions-instruction set, functions- interrupts low power modes.

UNIT IV PIC CONTROLLER **9**

PIC microcontrollers: History and features –Architecture – memory organization – addressing modes – instruction set – PIC progrmming –I/O port, Data Conversion, RAM & ROM Allocation.

UNIT V INTERFACING – CASE STUDY **9**

Interfacing PIC to LCD – Keyboard– parallel and serial ADC, DAC– Stepper motor interfacing.

TEXT BOOKS

1. Sriram. V.Iyer& Pankaj Gupta, "Embedded real time systems Programming", Tata McGraw- Hill, 2007.
2. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey ' PIC Microcontroller and Embedded Systems using Assembly and C for PIC18', Pearson Education 2008 .
3. John Iovine, 'PIC Microcontroller Project Book ', McGraw Hill 2000

REFERENCES

1. Rajkamal, "Embedded system-Architecture, Programming and Design", 2nd edition Tata McGraw-Hill, 2003.
2. John H. Davies, "MSP430 Microcontroller Basics", Newnes publishers, First edition, 2008.
3. Rafiquzzaman**.M,** "Microcontroller Theory and Applications with the PIC18F", Wiley 2011.
4. http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/microcontrollers/micro/ui/Course_home1_1.htm

PROGRAM ELECTIVE – 3

U18PEEE31	**High Voltage Engineering**	**L**	**T**	**P**	**C**
	Total Contact Hours – 40	3	0	0	3
	Prerequisite –Power system I&II				
	Course Coordinator: Ms.Anitha Sampathkumar Department:EEE				

OBJECTIVES To gain the knowledge on various issues related to power system equipment's and to take up the suitable measures for fault protection.

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	To Remember Electrical System Components
CO2	U	ToUnderstand generation of High Voltage, insulation and Measurement of D. C., A.C., & Impulse voltages.
CO3	A	To Apply the safe methods in power generation and transmission
CO4	An	To Analyze the high voltages and currents in power system components
CO5	E	To Evaluate High Voltage Testing of Electrical Apparatus and High Voltage Laboratories
CO6	C	Design High voltage laboratory layout, indoor and outdoor

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	1		1	2	1								2	--
	CO2	1		1		2	2	2		1				2	--
	CO3	2		1		1	3			1				2	--
	CO4	2		1	2	1	2		1	1		1		3	3
	CO5	1		1	2	1	1	2		1		1		3	3
	CO6	1		2										3	3
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

SYLLABUS

UNIT I Breakdown in Gases, liquid and solid Insulating materials 15 Hours

Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge, Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

UNIT II Generation of High Voltages 7 Hours

Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT III Measurements of High Voltages and Currents 7 Hours

Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.

UNIT IV Lightning and Switching Over-voltages 8 Hours

Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges. Switching over-voltages, Protection against over-voltages, Surge diverters, Surge modifiers.

UNIT V High Voltage Testing of Electrical Apparatus and High Voltage Laboratories 8 Hours

Various standards for HV Testing of electrical apparatus, IS, IEC standards, Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

Text books

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering", McGraw Hill Education, 2013.
2. L. Wadhwa, "High Voltage Engineering", New Age International Publishers, 2007.

Reference Books

1. D. V. Razevig (Translated by Dr. M. P. Chourasia), "High Voltage Engineering Fundamentals", Khanna Publishers, 1993.
2. E. Kuffel, W. S. Zaengl and J. Kuffel, "High Voltage Engineering Fundamentals", Newnes Publication, 2000.
3. R. Arora and W. Mosch "High Voltage and Electrical Insulation Engineering", John Wiley & Sons, 2011.
4. Various IS standards for HV Laboratory Techniques and Testing.

U18PEEE32	**Solid State AC Drives**	**L**	**T**	**P**	**C**
	Total Contact Hours – 43	3	0	0	3
	Prerequisite – Electrical Machines I , Power Electronics				
	Course Coordinator: Ms Hemadhavi Department:EEE				

OBJECTIVES

To study and understand the operation of Induction motor drives and Synchronous motor drives.

COURSE OUTCOMES (COs)		
CO1	R	To remember basics of AC Motor.
CO2	U	To understand Rotor, Voltage and frequency control and Slip Power Recovery Scheme
CO3	A	To apply Rotor, Voltage and frequency control in AC Drives
CO4	An	To analyze AC Motor Drives
CO5	E	To predict Rotor and stator characterictics
CO6	C	To Design slip power recovery scheme

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1		1	1					1		3	2		1	2
	CO2		1	1					1		3	2		1	2
	CO3		1	1					1		3	2	2	1	2
	CO4		1	1					1		3	2		1	2
	CO5		1	1					1		2	2	1	1	2
	CO6		2	2					2		2	2	2	3	3
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

SYLLABUS

UNIT I STATOR VOLTAGE CONTROL OF INDUCTION MOTOR 9

Torque, slip characteristics, operation with different types of loads, performance comparison of different AC power controllers speed reversal, closed loop control.

UNIT II STATOR FREQUENCY CONTROL 9

Operation of induction motor Non-Sinusoidal supply waveforms, Variable frequency, operation of 3 phase induction motor, constant flux operation, current fed operation dynamic and regenerative braking of CSI and VSI fed drives.

UNIT III ROTOR RESISTANCE CONTROL 9

Torque, slip characteristics, types of rotor choppers, torque equation, constant torque operation, TRC strategy, combined stator voltage control and rotor resistance control.

UNIT IV SLIP POWER RECOVERY SCHEME 9

Torque equation, torque – slip characteristics-power factor consideration, Sub-Synchronous operation closed loop control.

UNIT V SYNCHRONOUS MOTOR DRIVES 9

Need for leading pf operation –open loop VSI fed and its characteristics –self-control torque angle control –power factor control- Brushless excitation systems staring, principles of vector control

Total Periods: 45

REFERENCES

1. Dubey, G.K. ‘’Power Semiconductor controlled drives’’, Prentice Hall international, New Jersey,1989
2. Dewan, S.B. Slemon, G.R. Straughen, ‘’A Power Semiconductor Drives’’ John Wiley and Sons New York, 1984

U18PEEE33	**Energy Management & SCADA**	**L**	**T**	**P**	**C**
	Total Contact Hours – 42	3	0	0	3
	Prerequisite –Power System I&II				
	Course Coordinato Ms.Aarthi SuriyaDepartment:EEE				

OBJECTIVES The students will learn about the various Applications Programs (Aps) running in an Energy Management Systems (EMS) and their execution through SCADA.

COURSE OUTCOMES (COs)		
CO1	R	To remember an energy management systems, network analysis and SCADA.
CO2	U	To understand the power system automation, architecture and application of SCADA.
CO3	A	To apply the SCADA controlling system an electric power generation, transmission, distribution and also in real time.
CO4	An	To analyze an interpret software and hardware assembly in energy control centers.
CO5	E	To evaluate an implementation of power system automation and protection.
CO6	C	To design system for industrial applicationsSCADA

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO2
2	CO1			2		2			2			2		2	2
	CO2			2		2			2			2		2	2
	CO3			2		2			2			2	1	2	2
	CO4			2		2			2			2		2	2
	CO5			2		2			2			2	2	2	2
	CO6			3		3			3			3		3	3
3	Category	**PROGRAM ELECTIVE**(PE)													
4	Approval														

SYLLABUS

UNIT I EMS 9 Hours

Introduction to EMS, Objectives, Evolution of EMS, Evolution of SCADA, Function and Benefits of EMS, EMS Architecture, Practical EMS, Working of EMS, Power System Security: Introduction, Static Security Assessment, Operating states of Power System. Real Time or Online Application: Control Function, Protection Function, Operating States of Power System.

UNIT II Network Analysis Function of EMS 9 Hours

Real Time Function, Extended Real Time Function, State Estimation: Introduction, Conventional State Estimation, Linear state estimation. Economic Dispatch and Optimal Power Flow: Introduction, Economic Dispatch, Generation Model, Economic Dispatch Problem, Optimal Power Flow problem Formulation.

UNIT III SCADA 8 Hours

Introduction to SCADA, Evolution of SCADA, Benefits of SCADA, Function of SCADA, SCADA in Process control, SCADA Application, Usage of SCADA, Real-Time Monitoring and Control using SCADA, Data Acquisition, Data Communication, Data Presentation, Control.

UNIT IV SCADA Hardwar 8 Hours

Introduction, SCADA hardware Functions, Remote Terminal Units, SCADA RTU, Basic Functions, RTU Standards, Difference Between RTU and PLC, Features of SCADA. SCADA Software and Protocols: Introduction to ISO Model, DNP3 Model, Important Features of DNP3, IEC60870 PROTOCOL, HDLC, Modbus Protocol.

UNITV Power System Automation 8 Hours

Benefits of Power System Automation, Power System Automation, Architecture For Power System Automation, Classification of Power system Automation, Implementation of Power System Automation and Protection Using SCADA, SCADA Based Model for Automation and Digital Protection.

Text/Reference Books

1. Energy Management Systems", Handschin, E. Springer Verlag, 1990.
2. Real Time Control of Electric Power Systems", Handschin, E Elsevier, 1972.
3. Electric Power Substation Engineering", John D Mc Donald, CRC press, 2001.
4. Power Generation Operation and Control", Wood, A. J and Wallenberg, B. F, 2nd Edition John Wiley and Sons, 2003.

5. Control and Automation of Electric Power Distribution Systems, Green, J. N, Wilson, R
6. Energy Management Handbook, Turner, W. C 5th Edition, Taylor and Francis

U18PEEE34	**BIO-MEDICAL INSTRUMENTATION**	**L**	**T**	**P**	**C**
	Total Contact Hours – 43	3	0	0	3
	Prerequisite – Measurements and instruments				
	Course Coordinator: Mr.K.Dwarakesh Department: EEE				

OBJECTIVES

Discuss the internal circuitry of medical instruments and its maintenance.

COURSE OUTCOMES (COs)		
CO1	R	To remember physiology and anatomy of human system
CO2	U	To understand the technical concepts and operation of medical instrumentation
CO3	A	To apply and render a broad and modern account of biomedical instruments.
CO4	An	To analyze introductory idea about human physiology system which is very important with respect to design consideration
CO5	E	To evaluate an implementation of automation and protection system
CO6	C	To Test Biomedical application instruments

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	G	h	i	j	k	l	PSO 1	PS O2
2	CO1		1	1					1		1	2		1	2
	CO2		1	1					1		1	2		1	2
	CO3		1	1					1		1	2	2	1	2
	CO4		1	1					1		1	2		1	2
	CO5		1	1					1		2	2	1	1	2
	CO6		2	2					2		2	2		3	3
3	Category	**PROGRAM ELECTIVE COURSE (PE)**													
4	Approval														

SYLLABUS

UNIT I PHYSIOLOGY AND TRANSDUCERS 9

Electrophysiology: cell and its functions- Neuron-Axon-Synapse-Action Potential - Propagation of electrical impulses along the axon-Sodium sump-Salutatory condition-Electrophysiology and Cardiopulmonary systems- Respiration and nervous system and peripheral nervous system

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS 9

Sensors and recorders: psychological transducer-general consideration for electronic recording systems- basic recording systems-pre amplifiers-direct writing recorders- UV recorders-electrostatic recorders-instrumentation tape recorders

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS 9

Modem imaging systems: X- ray machines and computed Tomography-magnetic resonance imaging systems--ultrasonic imaging systems-medical thermography-electron microscope

UNIT IV MEDICAL IMAGING AND PMS 9

Diagnostic equipment's: electrocardiograph-electroencephalograph-electromyography-blood flow meters-blood gas analyzers-computer applications in medical field- ultrasonic equipment's-bio telemetry-transmission of physiological data

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS 9

Therapeutic equipment's: pace makers- defibrillators-dialyzers-surgical diathermy machines-later applications-physiotherapy and electrotherapy equipment's

TEXT BOOKS

1. Arumugam M. 'BioMedical Instrumentation ', Anumdhaa Agencies ,1992
2. Gedders L.A. and Baker L.E. ' principles of Applied Bio- Medical instrumentation', john Wiley, 1989.

REFERENCES

1. Bertill Jacobson and john G. Webster 'Medicaland clinical Engineering' Prentice HallIndia , 1977
2. Gedders L.A and Baker L.E 'principles of applied Bio- medical instrumentation', John Wiley-Interscience, 3rd Edition, 1989.

PROGRAM ELECTIVE – 4

18PECBEE41	**Power Quality**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Power System I&II				
	Course Coordinator: Dr.V.Jayalakshmi Department:EEE				

COURSE OUTCOMES (COs)		
CO1	R	To remember the significance of power quality and powerfrequency.
CO2	U	To understandaboutthe load compensation methods.
CO3	A	To apply DSTATCOMin load compensation.
CO4	An	To analyze an effect of harmonics in power system
CO5	E	To evaluate the power quality and overvoltage problems.
CO6	C	Realization and control of DSTATCOM – DSTATCOM and Compensators

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	G	h	i	j	k	l	PSO 1	PSO 2
2	CO1	3	1	1		2	2	3	3	3	3	3	3	1	2
	CO2	3	1	1										1	2
	CO3	2	1	2		2	2	1	2	2	2		2	1	2

	CO4	2	1	2						1	1	1		1	2
	CO5	1	1	2			2	2	2		2		3	1	2
	CO6	3	3	2			2	2	2		2			3	3
3	Category	**Program Elective Course (PE)**													
4	Approval														

OBJECTIVES

To understand the various power Quality Phenomenon, their origin and mitigation methods.
Understand the effects of various power quality phenomenon in various equipment.

SYLLABUS

UNIT I Introduction 9 Hours

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Nonlinear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

UNIT II Analysis of Single Phase And Three Phase System 9 Hours

Single phase linear and nonlinear loads – single phase sinusoidal, non-sinusoidal source – supplying linear and nonlinear load – three phase Balance system – three phase unbalanced system – three phase unbalanced and distorted source supplying nonlinear loads – concept of pf – three phase three wire – three phase four wire system.

UNIT III Conventional Load Compensation Methods 9 Hours

Principle of load compensation and voltage regulation – classical load balancing problem: open loop balancing – closed loop balancing, current balancing – harmonic reduction and voltage sag reduction – analysis of unbalance – instantaneous of real and reactive powers – Extraction of fundamental sequence component from measured.

UNIT IV Load Compensation Using DSTATCOM 9 Hours

Compensating single – phase loads – Ideal three phase shunt compensator structure – generating reference currents using instantaneous PQ theory – Instantaneous symmetrical components theory – Generating reference currents when the source is unbalanced – Realization and control of DSTATCOM – DSTATCOM in Voltage control mode

UNIT V Series Compensation Of Power Distribution System 9 Hours

Rectifier supported DVR – DC Capacitor supported DVR – DVR Structure – voltage Restoration – Series Active Filter – Unified power quality conditioner.

TEXT/REFERENCE BOOKS

1. Arindam Ghosh “Power Quality Enhancement Using Custom Power Devices”, Kluwer Academic Publishers, 2002
2. G.T.Heydt, “Electric Power Quality”, Stars in a Circle Publications, 1994(2nd edition)
3. Power Quality - R.C. Duggan
4. Power System Harmonics –A.J. Arrillga
5. Power Electronic Converter Harmonics –Derek A. Paice

U18PEEE42	SOLID STATE RELAYS	L	T	P	C
	Total Contact Hours – 43	3	0	0	3
	Prerequisite – Power Electronics				
	Course Coordinator: Ms.S.Sherine Department:EEE				

OBJECTIVES

- To educate the basic concepts and new developments in solid state relays and power system protection

COURSE OUTCOMES (COs) Students will be able to		
CO1	R	To remember thedifferentprotective equipment's, power relays, etc.…
CO2	U	To understand the different applications of the relays, circuit breakers, grounding for different elements of power system.
CO3	A	To apply the various types of relay testing in power system protection.
CO4	An	To analyze a microprocessor based relays.
CO5	E	To evaluate the inverse time characteristics.
CO6	C	To design Microprocessor Based Relays

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	G	h	i	j	k	l	PSO 1	PSO 2
2	CO1		1	1					1		3	2		1	2
	CO2		1	1					1		3	2		1	2
	CO3		1	1					1		3	2		1	2
	CO4		1	1					1		3	2		1	2
	CO5		1	1					1		2	2	1	1	2
	CO6		2	2					2		2	2		3	3
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

SYLLABUS

UNIT I INTRODUCTION OF RELAYS 9

Comparators: phase and amplitude comparators-types-Direct and integrating rectifier bridge, circulating current, opposed voltage coincident type phase comparator-Direct or block spike phase comparator, phase splitting technique, integrating type phase comparator with transistor AND gate, hybrid comparator with transistor AND gate. Hybrid comparator- Hall effect type and magneto resistivity type, vector product type - zener diode phase comparators-Multi input-Three input coincidence comparators

UNIT II RELAY CIRCUIT 9

Static relay circuit (using analog and digital ic's) for over current, inverse time characteristics, differential relay.

UNIT III RELAY CIRCUIT 9

Static relay circuits fort generator loss of field, under frequency, distance relay, impedance, reactance, reverse power relays.

UNIT IV TRANSIENT BEHAVIOR OF RELAYS 9

Static relay circuits for carrier current protection-steady state and transient behavior of static relay-testing and maintenance - tripping circuits using thyristors.

UNIT V MICROPROCESSOR BASED RELAYS 9

Microprocessor based relays: hardware and software for the measurement of voltage, current, frequency, phase angle-microprocessor implementation of over current relays-inverse time characteristics-impedance relay-directional relay-mho relay.

TEXT BOOKS

1. Badri Ram, D. N. Vishwakarma 'power system protection and switchgear',22nd Edition, Tata Mcgraw Hill, 2001.
2. Rao, T.S.M. Power System Protection And Switch Gear, 2nd Edition, Wiley Eastern Ltd,1979.

REFERECE BOOKS

1. Van. C.Wamngton. 'Protective Relays- their theory and practice', 2nd Edition, Chapman and hall
2. Russel c. Mason, "The art and science of protective relays" 1st Edition. John Wiley and Sons Ltd
3. www.electromagneticrelays.in

U18PEEE43	**RENEWABLE ENERGY SOURCES**	**L**	**T**	**P**	**C**
	Total Contact Hours – 43	3	0	0	3
	Prerequisite – Basic Electrical & Electronics Engineering				
	Course Coordinator: Dr. S.Prakash Department:EEE				

OBJECTIVES

To create awareness among the students about the different types of non-conventional energy resources and emphasize its importance

COURSE OUTCOMES (COs) After completion of the course the student will be able to		
CO1	R	Remember about renewable energy sources.
CO2	U	Able to understand how renewable energy can be used to help reduce greenhouse gases.
CO3	A	Apply ideas to perform case studies on renewable energy systems.
CO4	An	To analyze about the various energy generation technologies.
CO5	E	Criticize wind and solar systems
CO6	C	To design solar energy applications water heaters, air heaters, solar cooking, solar drying and power generation-tower concept (solar plant)-solar pump

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	G	h	i	j	k	l	PSO 1	PSO 2
2	CO1		1	1					1		3	2		1	2
	CO2		1	1					1		3	2		1	2
	CO3		1	1					1		3	2	M	1	2
	CO4		1	1					1		3	2		1	2
	CO5		1	1					1		3	2	1	1	2
	CO6		1	1					1		3	2		1	2
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

UNIT I INTRODUCTION ABOUT ENERGY RESOURCES 9

General primary and commercial energy resources- study of availability-energy consumption pattern and growth rath in India- non –commercial energy sources –availability, economics and efficiency

UNIT II SOLAR ENERGY AND APPLICATIONS OF SOLAR ENERGY 9

Solar energy and application; solar radiation-principles of solar energy collections- types of collectors-characteristics and principles of different types of collectors- their efficiencies-solar energy applications water heaters, air heaters, solar cooking, solar drying and power generation-tower concept (solar plant)-solar pump

UNIT III WIND ENERGY 9

Wind energy: energy from wind-general theory of wind mills - types of wind mills-performance of wind machines-wind power – efficiency.

UNIT IV TIDAL AND GEOTHERMAL ENERGY 9

Tidal Energy from tides and waves- working principles of tidal plants-tidal power generations –geothermal energy-principle of working of geothermal power plants

UNIT V BIOMASS ENERGY 9

Bio energy: energy from bio mass-biogas plants-various types-industrial wastes-municipal wastes-burning plants-energy from the agricultural wastes- applications

TEXT BOOKS

1. Rai.G.D, "Non-conventional resources of energy", Khanna publishers, Fourthedition, 2010.
2. Khan.B.H,"Non-Conventional Energy Resources", The McGraw Hills, Second edition, 2009.

REFERENCE BOOKS

1. S.P.Sukhatme,' Solar Energy,(principles of thermal collection and storage), Tata McGraw-Hill Publishers, Fourth print-February 1989
2. Ronald Shaw,'Wave Energy – (A Design Challenge)',Ellis Horwood Limited publishers, first edition- 1982
3. http://nptel.ac.in/courses/113104058/mme_pdf/Lecture1.pdf

U18PEEE44	**Industrial Electrical Systems & Automation**	**L**	**T**	**P**	**C**
	Total Contact Hours – 42	3	0	0	3
	Prerequisite –Power system II and Measurement& Instrumentation				
	Course Coordinator: Ms Rathika. RDepartment:EEE				

OBJECTIVES At the end of this course, students will demonstrate the ability to

- Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
- Understand various components of industrial electrical systems.
- Analyze and selectthe proper size of various electrical system components.

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Remember the principles of batteries.
CO2	U	Understand the construction of batteries.
CO3	A	Apply the knowledge of Electrical and Electronics engineering concepts in Automotive controls.
CO4	An	Analyzing Electronic Fuel Injection, starting, Ignition Systems and Sensors.
CO5	E	Identify, demonstrate and compare the various components and systems of Auto electrical stems.
CO6	C	To explore practically about the components present in an Automotive electrical and Electronics system.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO2
2	CO1			2					1	2	2	2		2	
	CO2			2					1	2	2	2	M	2	
	CO3			2					1	2	2	2		2	
	CO4			2					1	2	2	2		2	
	CO5			2					1	2	2	2		2	
	CO6			2		2			2	2	2	2	1	1	1
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

SYLLABUS

UNIT I Electrical System Components 8 Hours

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

UNIT II Residential and Commercial Electrical Systems 8 Hours

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

UNIT III Illumination Systems 6 Hours

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

UNIT IV Industrial Electrical Systems I 8 Hours

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing

design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT V Industrial Electrical Systems II 6 Hours

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

UNIT VI Industrial Electrical System Automation 6 Hours

Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

Text/Reference Books

- S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating &Costing", Khanna publishers, 2008.
- K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.
- S. Singh and R. D. Singh, "Electrical estimating and costing", DhanpatRai and Co., 1997.
- Web site for IS Standards.
- H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.

PROGRAM ELECTIVE – 5

U18PEEE51	**Power System Dynamics and Control**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Power System II				
	Course Coordinator: Dr.V.Jayalakshmi Department:EEE				

OBJECTIVES

To gain fundamental knowledge of the power system mathematical modelling and predict power system dynamic behavior during and after disturbances.

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	To explain the methods to enhance the small signal stability of the power system.
CO2	U	Understand the concept of stability problems in power system.
CO3	A	Apply the concepts of modeling and simulating the dynamic phenomena of power systems, Interpret results of system stability studies
CO4	An	Analysis of Linear Dynamical System& issues in modeling
CO5	E	Evaluating the system stability and controllers.
CO6	C	To develop dynamic modeling of a synchronous machine&and Associated Controllers

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2

2	CO1	1	1			1		3	2	2	2	1	2	1	2
	CO2		1			1		3	2	2	2	1	2	1	2
	CO3		1			1		3	2	2	2	1	2	1	2
	CO4	1	1			1		3	2	2	2	1	2	1	2
	CO5	1	1			1		3	2	2	2	1	2	1	2
	CO6														
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

SYLLABUS

UNIT I Introduction to Power System Operations 3 Hours

Introduction to power system stability.Power System Operations and Control.Stability problems in Power System.Impact on Power System Operations and control.

UNIT II Analysis of Linear Dynamical System and Numerical Methods 5 Hours

Analysis of dynamical System, Concept of Equilibrium, Small and Large Disturbance Stability.Modal Analysis of Linear System.Analysis using Numerical Integration Techniques. Issues in Modeling: Slow and Fast Transients, Stiff System.

UNIT III Modeling of Synchronous Machines and Associated Controllers 12 Hours

Modeling of synchronous machine: Physical Characteristics.Rotor position dependent model.D-Q Transformation.Model with Standard Parameters.Steady State Analysis of Synchronous Machine.Short Circuit Transient Analysis of a Synchronous Machine.Synchronization of Synchronous Machine to an Infinite Bus.Modeling of Excitation and Prime Mover Systems.Physical Characteristics and Models.Excitation System Control.Automatic Voltage Regulator.Prime Mover Control Systems. Speed Governors.

UNIT IV Modeling of other Power System Components 10 Hours

Modeling of Transmission Lines and Loads.Transmission Line Physical Characteristics.Transmission Line Modeling. Load Models - induction machine model. Frequency and Voltage Dependence of Loads. Other Subsystems – HVDC and FACTS controllers, Wind Energy Systems.

UNIT V Stability Analysis 11Hours

Angular stability analysis in Single Machine Infinite Bus System.Angular Stability in multi-machine systems – Intra-plant, Local and Inter-area modes. Frequency Stability: Centre of Inertia Motion. Load Sharing: Governor Droop. Single Machine Load Bus System: Voltage Stability. Introduction to Torsional Oscillations and the SSR phenomenon. Stability Analysis Tools: Transient Stability Programs, Small Signal Analysis Programs.

UNIT VI Enhancing System Stability 4 Hours

Planning Measures.Stabilizing Controllers (Power System Stabilizers).Operational Measures-Preventive Control.Emergency Control.

Text/Reference Books

1.K.R. Padiyar, “Power System Dynamics, Stability and Control”, B. S. Publications, 2002.
2.P. Kundur, “Power System Stability and Control”, McGraw Hill, 1995.

3.P. Sauer and M. A. Pai, "Power System Dynamics and Stability", Prentice Hall, 1997.

U18PEEE52	**Power Converter Analysis and Design**	**L**	**T**	**P**	**C**
	Total Contact Hours – 40	3	0	0	3
	Prerequisite – Analog Electronics Circuits & Digital Electronics				
	Course Coordinator: Mrs.S.SherineDepartment:EEE				

OBJECTIVES

To gain the knowledge on power converter analysis and design

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Learning power electronics system simulation and control methods
CO2	U	Understanding operation and analysis of switched mode DCDC converters and their signing.
CO3	A	Apply suitable controllers to converters and inverters
CO4	An	Skill of analyzing power electronic devices
CO5	E	Fitness in mitigating converter harmonics.
CO6	C	Developing Ripple free system for renewable energy sources.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	G	H	i	j	k	l	PSO 1	PSO2
2	CO1		2	2								2	2	2	1
	CO2		2	2								2	2	2	1
	CO3		2	2								2	2	2	1
	CO4		2	2								2	2	2	2
	CO5		2	2								2	2	2	2
	CO6		2	2								2	2	2	2
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

SYLLABUS

UNIT 1 SNUBBER AND DRIVE CIRCUITS

Design considerations: Snubber circuit for power switching devices Thermal design: temperature control, Heat sink Gate Trigger Circuits for Thyristors Base drive circuits for BJT and Gate drive circuit for MOSFET Practical converter design considerations

UNIT II ANALYSIS AND DESIGN OF DC-DC CONVERTERS

Classification of DC-DC converters. Analysis of buck, boost in continuous and discontinuous operations Analysis of buck- boost, Cuk and Sepic converters in continuous and discontinuous operations Analysis of Forward, Fly back ,half bridge and full bridge isolated converters Design of isolated and non-isolated DC-DC converters Estimating the Output Voltage Ripple in Converters Containing Two-Pole Low-Pass Filters, Input and output filter design

UNIT III ANALYSIS AND DESIGN OF MULTILEVEL INVERTERS

Multilevel concept, Classification of multilevel inverters Diode clamped, improved diode Clamped, Flying capacitors multilevel inverter analysis. Design of multilevel inverters Influence of PWM techniques on switching loss, design of PWM for low inverter loss

UNIT 1V DESIGN OF CONVERTER CONTROL

Control and analysis of voltage mode and current modes. Review of different controllers used in power electronic converters Introduction to controller design Sliding Mode Control of Power Converters , Fuzzy Logic Control of Power Converters

UNIT V RESONANT CONVERTERS

Principles of resonant converters, Classical series resonant and parallel resonant converters, Quasi-Resonant Converters, Multi resonant Converters, Zero-VoltageTransition (ZVT) Converters, Zero-voltage and Zero-current switching, Resonant converter design techniques based on frequency response

Text

1. Ned Mohan, Tore M. Undeland, William P. Robbins, “Power Electronics Converters, Applications, and Design”, Wiley India PvtLtd,Third Edition, 2011.
2. Rashid M.H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, Third Edition,2011.

References

1. Umanand.L ,"Power Electronics Essentials and Applications", John Wiley & Sons, First Edition 2009.
2. Erickson R. W. and Maksimovic .D, “Fundamentals of Power Electronics”, Kluwer Academic Publishers,Second Edition, Reprint 2012.
3. http://www.peg.ee.iisc.ernet.in/people/faculty/vram/smpc/smpcbook.pdf-Course Material on Switched Mode Power Conversion, V. Ramanarayanan 2008.
4. M.H. Rashid “Power Electronics Handbook”, ISBN 978-0-12-382036-5, Elsevier Third Edition, 2011

U18PEEE53	**ELECTRIC POWER DISTRIBUTION SYSTEM**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Power System I				
	Course Coordinator: Dr.S.P.VijayaraghavanDepartment:EEE				

OBJECTIVES

Student will be able to:

1. Learning about power distribution system
2. Learning of SCADA System
3. Understanding Distribution Automation

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Remember the process power distribution system
CO2	U	Understand the concept of Distribution Management System, Optimum Switching Device Placement , Control & Communication Systems
CO3	A	To apply the concept of Distribution Management System, Control & Communication Systems using SCADA system
CO4	An	Analyze the Distribution automation and its application in practice&Coordination of Protective Devices
CO5	E	Differentiate the types of loads and their characteristics
CO6	C	Design a radial and loop type distribution feeders.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO2
2	CO1	1		1		1		2	1						1
	CO2			1		1			1						1
	CO3	1				1	2		1			1		1	1
	CO4		1			1		2	1			1	2		1
	CO5					1			1			1			1
	CO6	1					2					1	1	3	3
3	Category	PROGRAM ELECTIVE(PE)													
4	Approval														

SYLLABUS

UNIT I Load Forecasting&Power Management 8 Hours

Distribution of Power, Management, Power Loads, Load Forecasting Short-term & Long-term, Power System Loading, Technological Forecasting.

UNIT II Distribution Automation 8 Hours

Advantages of Distribution Management System (D.M.S.) Distribution Automation: Definition, Restoration / Reconfiguration of Distribution Network, Different Methods and Constraints Power Factor Correction.

UNIT III Control & Communication system 8 Hours

Interconnection of Distribution, Control& Communication Systems, Remote Metering, Automatic Meter Reading and its implementation.

UNIT IV SCADA 8 Hours

SCADA: Introduction, Block Diagram, SCADA Applied To Distribution Automation. Common Functions of SCADA, Advantages of Distribution Automation through SCADA.

UNIT V Switching operation and Types 7 Hours

Calculation of Optimum Number of Switches, Capacitors, Optimum Switching Device Placement in Radial, Distribution Systems, Sectionalizing Switches – Types, Benefits, Bellman's Optimality Principle, Remote Terminal Units, Energy efficiency in electrical distribution & Monitoring.

UNIT VI Automation Distribution Systems 6 Hours

Maintenance of Automated Distribution Systems Difficulties in Implementing Distribution. Automation in Actual Practice, Urban/Rural Distribution, Energy Management, AI techniques applied to Distribution Automation.

REFERENCES

1. A.S. Pabla, "Electric Power Distribution", Tata McGraw Hill Publishing Co. Ltd., Fourth Edition.
2. M.K. Khedkar, G.M. Dhole, "A Text Book of Electrical power Distribution Automation", University Science Press, New Delhi
3. Anthony J Panseni, "Electrical Distribution Engineering", CRC Press
4. JamesMomoh, "Electric Power Distribution, automation, protection & control", CRC Press.

U18PEEE54	INSTRUMENTATION AND CONTROL IN POW PLANT INDUSTRIES	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Measurement & Instrumentationand Control System				
	Course Coordinator: Ms.Aarthi SuriyaDepartment:EEE				

OBJECTIVES

We can know about the various methods of power generation and its control methods.

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Remember different power generation process.
CO2	U	Understand the important parameters that has to be monitored and controlled
CO3	A	To get an detailed knowledge about Nuclear Power Plant Instrumentation and apply it in control loops
CO4	An	To be familiar about the various parameters that has to be analyzed and measured analytically.
CO5	E	Evaluate the working of boilers
CO6	C	Design control loops for Boiler

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	PSO1	PSO2
2	CO1	3	3	3	3	3		3	3	3	3	3	3	2
	CO2	3			2	2	2	3	3				2	2
	CO3	3	2	1									2	2
	CO4		1	1	1								2	2
	CO5	1	1	1					1		1		2	2
	CO6	1	2	1	1	2		1	1	1	2	2	3	2
3	Category	PROGRAM ELECTIVE (PE)												
4	Approval													

SYLLABUS

UNIT I Overview of Power Generation 9 Hours

Brief survey of methods of power generation-Wind, Solar, Tidal, Geothermal, MHD, Fuel cells, Biomass-Conventional energy resources-Hydro, Nuclear, Gas, Thermal-Comparison of various conventional power plants-Importance of Instrumentation and control in power generation-P&I diagrams-P&I diagram of boiler-co-generation

.

UNIT II Turbine Monitoring and Control 9 Hours

Electrical parameters-Current, Voltage, Power, Energy, Frequency, Power factor etc-Non-electrical parameters-Flow of feed water, fuel, air and steam with correction factor for temperature and pressure-Speed, vibration, shell temperature monitoring and control-Steam pressure control-Lubricant oil temperature control- cooling system.

UNITIII Analytical Measurement 9 Hours

Oxygen measurement in flue gas-CO2 in flue gas-Combustibles analyzers-Infrared flue gas analyzers-Smoke detector-Dust monitor-Closed Circuit Television-Fuel analyzers-Pollution monitoring instruments

UNITIV Control Loops In Boilers 9 Hours

Combustion control-air-fuel ratio control-furnace draft control-drum level control- main steam and reheat steam temperature control-super heater control- attemperator- deaerator control-Distributed Control System in power plant interlocks in boiler operation. 188 IC-2013 SRM(E&T)

UNIT V Nuclear Power Plant Instrumentation 9 Hours

Introduction-Nuclear physics-Classification of nuclear reactors-Basic reactor systems-P&I diagram of Nuclear power plant-Radiation detection instruments- nuclear reactor control systems and allied instrumentation.

TEXT BOOKS

1. P. K. Nag, "Power Plant Engineering" 2nd Edition, Tata McGraw-Hill Education, 2002
2. Sam G. Dukelow, "The control of boilers" 2nd Edition, Research Triangle Park, 1991.

REFERENCES

1. R.K.Jain, "Mechanical and Industrial Measurements", 10th Edition, Khanna Publishers, New Delhi,1995.
2. Bela G Liptak, "Instrumentation in the processing industries"1st edition, Chilton Book Co, Chilton Book Co; 1973.
3. https://app.knovel.com/web/toc.v/cid:kpPCITCBH4.

PROGRAM ELECTIVE – 6

U18PEEE61	**Flexible AC Transmission Systems**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Power System II				
	Course Coordinator: Dr.V.Jayalakshmi Department:EEE				

OBJECTIVES

This course introduces the application of a variety of high power-electronic controllers for active and reactive power in transmission lines. Students are exposed to the basics, modeling aspects, control and scope for different types of FACTS controllers.

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Rememberthe basic concepts ofelectrical power transmission lines.
CO2	U	Understand and analyze the concept of FACTS
CO3	A	Apply various FACTS controllers according to compensation schemes.
CO4	An	Analyse the various types of compensation Techniques(VAR,TCSC,SVC , STATCOM,DVR)
CO5	E	Evaluation of Power flow, Stability analysis of various systems
CO6	C	Modelling of FACTS Controllers for Stability analysis.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1		2	3		3	3			2		3	3	2	2
	CO2		2	2		3	2			3		2		2	2
	CO3		2	2		2	2			2				2	2
	CO4		2	2		2	2			2		2		2	2

	CO5		2	2		1	3			3		2		2	2
	CO6		3	2		3	3			2				3	3
3	Category	Program Elective (PE)													
4	Approval														

Syllabus

UNIT I Introduction 9 Hours

Reactive power control in electrical power transmission lines -Uncompensated transmission line - series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II Static VAR Compensator (SVC) and Applications 9 Hours

Voltage control by SVC – Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator –Modelling of SVC for power flow and fast transient stability – Applications: Enhancement of transient stability – Steady state power transfer – Enhancement of power system damping.

UNIT III Thyristor Controlled Series Capacitor (TCSC) and Applications 9 Hours

Operation of the TCSC – Different modes of operation – Modelling of TCSC – Variable reactance model – Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit – Enhancement of system damping.

UNIT IV Voltage Source Converter Based FACTS Controllers 9 Hours

Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability - prevention of voltage instability. SSSC-operation of SSSC and the control of power flow–modelling of SSSC in load flow and transient stability studies.

UNIT V Co-Ordination of FACTS Controllers 9 Hours

Controller interactions – SVC – SVC interaction – Co-ordination of multiple controllers using linear control techniques – Control coordination using genetic algorithms.

Text Books

1. R.MohanMathur, Rajiv K.Varma, "Thyristor – Based Facts Controllers for Electrical TransmissionSystems", IEEE press and John Wiley & Sons, Inc, 2002.
2. Narain G. Hingorani, "Understanding FACTS -Concepts and Technology of Flexible ACTransmission Systems", Standard Publishers Distributors, Delhi- 110 006, 2011.
3. K.R.Padiyar," FACTS Controllers in Power Transmission and Distribution", New Age International (P) Limited, Publishers, New Delhi, 2008.

References

1. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE), 1999.
2. V.K.Sood,HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004 , Kluwer Academic Publishers, 2004.

U18PEEE62	**Power electronics application to renewable energy system**	**L**	**T**	**P**	**C**
	Total Contact Hours – 40	3	0	0	3
	Prerequisite – Power Electronics				
	Course Coordinator: Dr.Prakash.S Department:EEE				

OBJECTIVES To learn about the impacts of renewable energy generation on environment

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Remember various types of renewable energy sources& drives
CO2	U	Understand the concepts of PV,Wind and Hybrid energy sources
CO3	A	Applying appropriate maximum power point tracking techniques.
CO4	An	To analyze the performance of IG, PMSG, SCIG and DFIG.
CO5	E	Evaluating various operating modes of wind electrical generators and solar energy Systems.
CO6	C	To design different power converters namely AC to DC, DC to DC and Ac to AC Converters for renewable energy sources.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	c	d	e	f	g	H	i	j	k	l	PSO 1	PSO2
2	CO1		2	2								2		2	1
	CO2		2	2								2		2	1
	CO3		2	2								3	2	2	2
	CO4		2	2								2		2	2
	CO5		2	3								2		2	2
	CO6		3	2								2		3	3
3	Category	**PROGRAM ELECTIVE (PE)**													
4	Approval														

SYLLABUS

UNIT-I INTRODUCTION 9

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost- GHG Emission) – Qualitative study of different renewable energy resources: Solar, Wind, Ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT-II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION 9

Review of reference theory fundamentals – Principle of Operation and analysis: IG, PMSG, SCIG and DFIG.

UNIT-III POWER CONVERTERS 9

Solar: Block diagram of solar photo voltaic system – Principle of Operation: Line Commutated Converters (inversion – mode) –Boost and Buck- Boost Converters- Selection of Inverter, battery sizing, array sizing.

Wind: Three phase AC Voltage Controllers- AC-DC-AC Converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters- Matrix Converters.

UNIT-IV ANALYSIS OF WIND AND PV SYSTEMS 9

Standalone operation of fixed and variable speed wind energy conversion systems and solar system- Grid Connection Issues- Grid integrated PMSG and SCIG Based WECS- Grid integrated solar System.

UNIT-V HYBRID RENEWABLE ENERGY SYSTEMS 9

Need for Hybrid Systems- Range and type of Hybrid Systems- Case studies of Wind- PV- Maximum Power point Tracking(MPPT).

Total Periods: 45

REFERENCES

1. Rashid.M.H."Power Electronics Hand book", Academic press,2001.
2. Rai.G.D."Non conventional energy sources", Khanna Publishers,1993.
3. Rai.G.D."Solar energy Utilization "Khanna Publishers,1993.
4. Gray.L..Johnson. "Wind Energy System". Prentice Hall linc,1995.
5. Non-Conventional Energy Sources B.H.Khan Tata McGraw-hill Publishing company, New Delhi.

U18PEEE63	**WIND AND SOLAR ENERGY SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 39	3	0	0	3
	Prerequisite –Electrical Machines-I& II				
	Course Coordinator: Dr.K.Sakthivel Department:EEE				

OBJECTIVES

At the end of this course, students will demonstrate the ability to understand the energy scenario and the consequent growth of the power generation from renewable energy sources.

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Remember the design specifications wind and solar system.
CO2	U	Understand the basic renewable energy sources & systems.
CO3	A	Apply engineering techniques to build solar, wind energy systems.
CO4	An	Analyze and evaluate the implication of renewable energy.
CO5	E	Evaluating the concepts in solving numerical problems pertaining to solar radiation geometry and wind energy systems.
CO6	C	Demonstrate self -learning capability to design & establish renewable energy systems.

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low															
1	COs/Pos	a	b	C	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
2	CO1	2	1	1		2	2	3	3	3	3	3	3	1	2
	CO2	2	1	1										1	2
	CO3	2	1	2		2	2	1	2	2	2		2	1	2
	CO4	2	1	2						1	1	1		1	2
	CO5	2	1	2			2	2	2		2		3	1	2
	CO6	2	1	1		2	2	3	3	3	3	3	3	1	2
3	Category	**PROGRAMELECTIVE** (PE)													
4	Approval														

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UNIT I Physics of Wind Power 5 Hours

History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution function

UNIT II Wind generator topologies 12 Hours

Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.

UNIT III the Solar Resource 3 Hours

Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

UNIT IV Solar photovoltaic 8 Hours

Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV UNIT, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control.

UNIT V Network Integration Issues 8 Hours

Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.

UNIT VI Solar thermal power generation 3 Hours

Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

Text Books

1. T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2005.
2. G. M. Masters, “Renewable and Efficient Electric Power Systems**”,** John Wiley and Sons, 2004.
3. S. P. Sukhatme, “Solar Energy: Principles of Thermal Collection and Storage”, McGraw Hill, 1984.

References Books

1. H. Siegfried and R. Waddington, “Grid integration of wind energy conversion systems” John Wiley and Sons Ltd., 2006.
2. G. N. Tiwari and M. K. Ghosal, “Renewable Energy Applications”, Narosa ublications, 2004.
3. J. A. Duffie and W. A. Beckman, “Solar Engineering of Thermal Processes”, John Wiley & Sons, 1991.

U18PEEE64	**ROBOTICS AND AUTOMATION**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite- Measurement & Instrumentation				
	Course Coordinator: Mr.K.DwarakeshDepartment:EEE				

OBJECTIVES

To provide comprehensive knowledge of robotics in the design, analysis and control point of

COURSE OUTCOMES (COs) At the end of this course, students will demonstrate the ability to		
CO1	R	Remembering the perception of actuators,sensors&transducers
CO2	U	Understand the dynamics ,control of electric drives and Robotic programming
CO3	A	Select the appropriate sensor, actuators& grippers with the robotic systems.
CO4	An	Analyse the singularity issues associated with the operation of robotic systems
CO5	E	Evaluation of algebraic tools for the description of motion.
CO6	C	To develop the ability to and design the motion for articulated systems View

Mapping of Course Outcomes with Program outcomes (POs) (1/2/3 indicates strength of correlation) 3-High, 2-Medium, 1-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	PSO1	PSO2
2	CO1	2	1	1		2	2	3	3	3	3	3	3	1
	CO2	2	1	1										1
	CO3	2	1	2		2	2	1	2	2	2		2	1
	CO4	2	1	2						1	1	1		1
	CO5	2	1	2			2	2	2		2		3	1
	CO6	2	1	2			2	2	2		2		2	3
3	Category	**PROGRAM ELECTIVE (PE)**												
4	Approval													

Syllabus

UNIT I Basic concepts 9 Hours

Robotics – basic components – classification - performance characteristics- drives and control systems – electric , hydraulic and pneumatic actuators – control loops using current amplifiers and voltage amplifiers**.**

UNITII Sensors and Transducers 9 Hours

Sensors and vision systems; Transducers and sensors – tactile sensors –Proximity and range sensors –Acoustics sensors- visition systems – image Processing and analysis – image data reduction – segmentation feature

UNIT III Robotic Programming and Gripper 9 Hours

End effectors –type –mechanical gripper –vacuum cup- magnetic grippers – robot to end effectors interface –software for industrial robots – positive stop program-Point to point program and continuous path program.

UNIT IV Kinematics and path planning 9 Hours

Robot motion analysis and control manipulation kinematics – homogeneous Transformation

and robot dynamics configuration of a robot controller.

UNIT V Industrial Robot 9 Hours

Industrial robots –Robots for welding ,painting and assembling –remote Controlled robots for nuclear ,thermal and chemical plants –industrial Automation – typical examples of automated industries .

Text Books

1. MikellPGroover, "Industrial robotics : technology, programming, and applications" McGraw Hill New Delhi, 1996.
2. Ghosh, "Control in Robotics and Automation: Sensor Based Integration", Allied Publishers, Chennai, 1998.

References

1. Deb.S.R, "Robotics technology and flexible Automation", John Wiley1992.
2. Asfahl. C.R, "Robots and manufacturing Automation", John Wiley, USA ,1992.
3. https://www.youtube.com/watch?v=DaWMvEY3Qgc&list=PLED9EB384E656C007
4. http://www.nptel.ac.in/downloads/112101098/

OPEN ELECTIVES

U18OEEE01	**GREEN TECHNOLOGY**	**L**	**T**	**P**	**C**
	Total Contact Hours:45	3	0	0	3
	Course Coordinator: Dr.S.Prakash Department:EEE				
OBJECTIVES Green Technologies is a highly interdisciplinary degree program that emphasizes green systems and environment, energy technology and efficiency, and sustainability and society					

SYLLABUS

UNIT- I INTRODUCTION

Green Technology – definition- Importance – Historical evolution – advantages and disadvantages of green technologies-factors affecting green technologies- Role of Industry, Government and Institutions – Industrial Ecology – role of industrial ecology in green technology.

UNIT- II CLEANER PRODUCTION (CP)

Definition – Importance – Historical evolution – Principles of Cleaner Production–Benefits– Promotion – Barriers – Role of Industry, Government and Institutions – clean development mechanism, reuse, recovery, recycle, raw material substitution-Wealth from waste, case studies.

UNIT- III POLLUTION PREVENTION AND CLEANER PRODUCTION AWARENESS PLAN

Waste audit – Environmental Statement, carbon credit, carbon sequestration, carbon trading, Life Cycle Assessment – Elements of LCA – Life Cycle Costing – Eco Labelling.

UNIT -IV AVAILABILITY AND NEED OF CONVENTIONAL ENERGY RESOURCES

Major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Non-conventional energy sources: Solar Energy-solar energy conversion technologies and devices, their principles, working and application.

UNIT- V GREEN FUELS

Definition-benefits and challenges – comparison of green fuels with conventional fossil fuels with reference to environmental, economic and social impacts- public policies and market-driven initiatives. Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in Indian context; tidal and geothermal energy.

REFERENCES

- 'Pollution Prevention: Fundamentals and Practice' by Paul L Bishop (2000), McGraw Hill International.
- 'Pollution Prevention and Abatement Handbook – Towards Cleaner Production' by World Bank Group (1998), World Bank and UNEP, Washington D.C.
- 'Cleaner Production Audit' by Prasad Modak, C.Visvanathan and MandarParasnis (1995), Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok
- 'Handbook of Organic Waste Conversion' by Bewik M.W.M.
- 'Energy, The Solar Hydrogen Alternative' by Bokris J.O.
- 'Non-conventional Energy Sources' by Rai G.D.
- 'Solar Energy' by Sukhatme S.P.
- 'Waste Energy Utilization Technology' by Kiang Y. H.

U18OEEE02	**ELECTRICAL SAFETY**	**L**	**T**	**P**	**C**
	Total Contact Hours:45	3	0	0	3
	Course Coordinator: Dr.T.R.Rangaswamy Department:EEE				

OBJECTIVES

The objective of the course is to introduce IE rules and its significance, electrical safety in residen commercial and industrial installations. It also helps the students to know about the electrical safety during installation, testing and commissioning, operation and maintenance. Besides, it enables the stud to know more about the quality management**.**

SYLLABUS

UNIT I REVIEW OF IE RULES AND ACTS AND THEIR SIGNIFICANCE 9

Objective and scope– ground clearances and section clearances– standards on electrical safety safe limits of current, voltage–earthing of system neutral –Rules regarding first aid and firefighting facility.

UNIT II

ELECTRICAL SAFETY IN RESIDENTIAL, COMMERCIAL AND AGRICULTURAL INSTALLATIONS 9

Wiring and fitting–Domestic appliances– water tap giving shock–shock from wet wall–fan Firing shock–multi-storied building–Temporary installations–Agricultural pump installation – Do's and Don'ts for safety in the use of domestic electrical appliances.

UNIT III

SAFETY DURING INSTALLATION, TESTING AND COMMISSIONING, OPERATION AND MAINTENANCE 9

Preliminary preparations–safe sequence–risk of plant and equipment–safety documentation–

field quality and safety - personal protective equipment – safety clearance notice – safety precautions – safe guards for operators– safety.\

UNIT IV

ELECTRICAL SAFETY IN HAZARDOUS AREAS 9

Hazardous zones–class0,1 and 2– spark, flash overs and corona discharge and functional requirements– Specifications of electrical plants, equipments for hazardous locations– Classification of equipment enclosure for various hazardous gases and vapours– classification of equipment/enclosure for hazardous locations.

UNIT V PROTECTION SYSTEMS 9

Fuse – circuit breakers and overload relays – protection against over voltage and under voltage – safe limits of amperage – voltage –safe distance from lines-capacity and protection of conductor-joints-and connections-means of cutting of power-overload and short circuit protection-no load protection-earth fault protection-earthing standards FRLS insulation-insulation and continuity test-system grounding-equipment grounding-earth leakage circuit breaker (ELCB)-cable wires-maintenance of ground-ground fault circuit interrupter-use of low voltage-electrical guards-Personal protective equipment – safety in handling hand held electrical appliances and tools.

Total No. of Periods: 45

References

1. S. Rao, Prof. H.L. Saluja, "Electrical safety, fire safety EnggAnd safety management", Khanna Publishers. NewDelhi, 1988. PondicherryUniversity: Syllabus for B.Tech(EEE)FourthYear SYLLABUS.
2. Pradeep Chaturvedi, "Energy management policy, planning and utilization", Concept Publishing company,New Delhi, 1997.
3. Nagrath. I.J. and Kothari. D.P. "Power System Engineering", Tata McGrawHill Publishing company Ltd. New Delhi, 1998

U18OEEE03	**ENERGY CONSERVATION TECHNIQUES**	**L**	**T**	**P**	**C**
	Total Contact Hours:45	3	0	0	3
	Course Coordinator: Dr.S.P.Vijaraghavan Department:EEE				

OBJECTIVES

To analyze the pros and cons of

- Conventional energy conversion techniques
- Direct energy conversion systems
- Need and necessity of energy storage systems and their desirable characteristics
- Detail on thermodynamics and kinetics of fuel cells

SYLLABUS

UNIT I INTRODUCTION 8

Energy conversion – conventional techniques – reversible and irreversible cycles – Carnot, Stirling and Ericsson – Otto, Diesel, Dual, Lenoir, Atkinson, Brayton, rankine.

UNIT IIDIRECT CONVERSION OF THERMAL TO ELECTRICAL ENERGY8

Thermoelectric Converters – thermoelectric refrigerator – thermoelectric generator – Thermionic converters – Ferro electric converter – Nernst effect generator – thermo magnetic converter.

UNIT III CHEMICAL AND ELECTROMAGNETIC ENERGY TO ELECTRICAL ENERGY 9

Batteries – types – working – performance governing parameters – hydrogen energy – solar cells.

UNIT IV ENERGY STORAGE SYSTEMS 9

Introduction – storage of mechanical energy, electrical energy, chemical energy, thermal energy.

UNIT VFUEL CELLS11

Basics – working advantages and drawbacks – types – comparative analysis – thermodynamics and kinetics of fuel cell process – performance of fuel cell – applications.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Archie.W.Culp, Principles of Energy Conversion, McGraw-Hill Inc., 1991, Singapore
2. Kordesch. K, and Simader.G, Fuel Cell and Their Applications, Wiley-Vch, Germany 1996

REFERENCES

1. Kettari, M.A.Direct Energy Conversion, Addison-Wesley Pub. Co 1997
2. Hart A.B and Womack, G.J.Fuel Cells: Theory and Application, Prentice Hall, Newyork Ltd., London 1989

U18OEEE04	**PLC AND SCADA FOR INDUSTRIAL AUTOMATION**	**L**	**T**	**P**	**C**
	Total Contact Hours:45	3	0	0	3
	Course Coordinator: Dr.V.Jayalakshmi Department:EEE				

OBJECTIVES

This course introduces the student to practical methods of automatic control of machines, processes systems. Also the student will learn the PLC programming fundamentals and some knowledge in SCADA which are used in process automation industries.

SYLLABUS

UNIT I - INTRODUCTION TO AUTOMATION 9 hours

Architecture of industrial automation systems-Manufacturing plants and operations-Industrial control Systems- Process, Discrete manufacturing industries Fluid Power and Electrical Actuators- Piezoelectric Actuator-

UNIT II – PROGRAMMABLE LOGIC CONTROLLER BASICS 9 hours

Overview of PLC systems – parts of PLC –Input/output UNITs – power supplies and isolators – Fundamental PLC wiring diagram – relays – switches –transducers – sensors –seal-in circuits.

UNIT III – PROGRAMMING OF PLC 9 hours

Fundamentals of logic – Program scan – Relay logic – PLC programming languages – timers – counters – math instructions – data manipulation instructions – requirement of communication networks for PLC – connecting PLC to computer.

UNIT IV – SCADA **9 hours**

Definition – elements of SCADA system – history of SCADA – remote terminal unit (RTU) – discrete control – analog control – master terminal unit – (MTU) –operator interface.

UNIT V – DISTRIBUTED CONTROL SYSTEM **9 hours**

Evolution – Different architectures – local control unit – Operator Interface – Displays – Engineering Interface – DCS Applications in power plants – Iron plant –steel plant– Cement plant.

Text Books

1. “PLC and Industrial application”, MadhuchhandanGupts and SamarjitSen Gupta, pernram international pub. (Indian) Pvt. Ltd., 2011.
2.Ronald L Krutz, “Securing SCADA System”, Wiley Publication

Reference Books

1.1.GaryDunning,”Introduction to Programmable Logic Controllers”, Thomson,2nd Edition.
2.John W Webb, Ronald A Reis,”Programmable Logic Controllers: Principles and Application”, PHI Learning, Newdelhi, 5th Edition
3.Stuart A Boyer, “SCADA Supervisory Control and Data Acqusition”, ISA, 4th Revised edition