B.E. ELECTRICAL AND ELECTRONICS ENGINEERING CURRICULUM AND SYLLABI 2016 (FULL TIME PROGRAMME)

Department of Electrical and Electronics Engineering FACULTY OF ENGINEERING



KARPAGAM ACADEMYOFHIGHER EDUCATION (Deemed to be University) (Established Under Section 3 of UGC Act, 1956) Pollachi Main Road, EachanariPost, Coimbatore- 641021, India.

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OF STUDY AND SCHEME OF EXAMINATIONS (2016 and onwards)

SEMESTER - I

COURSE CODE	COURSETITLE	SUB AREA	PEO	РО	L	Τ	Р	C	CIA	ESE	TOTAL	CONTACT HOURS /WEEK
THEORY:												
16BECC101	Communicative English	HS	2	i,j,l	3	0	0	3	40	60	100	3
16BECC102	Engineering Mathematics - I	BS	2	a,b,e, l	3	2	0	4	40	60	100	5
16BEPH103/ 16BECH103	Engineering Physics /Engineering Chemistry CHOICE BASED	BS	1,2	a,b,c,e,g ,l	3	0	0	3	40	60	100	3
16BEEE104	Basic Electrical Engineering	ES	1,2	a,b,c,e,g ,l	3	0	0	3	40	60	100	3
16BEEE105	Basic Electronics Engineering	ES	1,2	a,b,c,e,g ,l	3	0	0	3	40	60	100	3
PRACTICAI	2:											
16BEPH111/ 16BECH111	Engineering Physics Laboratory /Engineering Chemistry Laboratory CHOICE BASED	BS	1,2	a,b	0	0	4	2	40	60	100	4
16BEEE112	Engineering Workshop Practices Laboratory	ES	1,2	a,c,d, e,f,j	0	0	4	2	40	60	100	4
16BEEE113	Computer Practice and programming Laboratory	ES	1	a,b,c, d,e,l	1	0	4	3	40	60	100	5
TOTAL					16	2	12	23	320	480	800	30

16BECC151* Human Values	MC	1,2	c,d,e,f	1	0	0	-	100*	-	-	1
	To	tal Cor	ntact Hou	rs/W	/eek	3 = 3	31 E	Iours			I

SEMESTER II

			SEME	ESTER 2								
COURSE CODE	COURSETITLE	SUB AREA	PEO	PO	L	Т	Р	C	CIA	ESE	TOTA L	CONTA CT HOURS/ WEEK
THEORY												
16BECC201A/ 16BECC201B	Business Communication/ Technical English CHOICE BASED	HS	1,2	i,j,l	3	0	0	3	40	60	100	3
16BECC202	Engineering Mathematics-II	BS	2	a,b,c,e,l	3	2	0	4	40	60	100	5
16BEPH203/ 16BECH203	Engineering Physics/Engineering Chemistry CHOICE BASED	BS	1,2	a,b	3	0	0	3	40	60	100	3
16BECC204	Environmental Sciences	HS	1	a,c,e,f,g, h,l	3	0	0	3	40	60	100	3
16BEEE205	Analysis of Electric Circuits	ES	1	a,b,c,d,e,l	3	2	0	4	40	60	100	5
PRACTICAL												
16BEPH211/ 16BECH211	Engineering Physics Laboratory / Engineering Chemistry Laboratory CHOICE BASED	BS	1,2	a,b	0	0	4	2	40	60	100	4
16BEEE212	Electric Circuits Laboratory	ES	2	a,c,d,e,f, j,l	0	0	3	2	40	60	100	3
16BEEE213	Engineering Graphics	ES	1,2	c,d	1	0	3	3	40	60	100	3
TOTAL					16	4	10	24	320	480	800	29

16BEEE251*	Aptitude Training	MC	1,2		1	0	0	-	100*	-	-	1
	Т	otal Con	tact H	ours/Week	=30	Ho	urs					

SEMESTER III

	SEMESTER 3 COURSE SUB PEO PO													
COURSE CODE	COURSETITLE	SUB AREA	PEO	РО	L	Т	Р	C	CIA	ESE	TOTAL	CONTACT HOURS/ WEEK		
THEORY														
16BEEE301A/ 16BEEE301B	Methods of Applied Mathematics / Linear Algebra and Special Function (CHOICE BASED)	BS	1,2	a,b,c,e,l	3	2	0	4	40	60	100	5		
16BEEE302	Electrical Machines-I(HC)	PC	1	a,b,c,d,e,j	3	0	0	3	40	60	100	3		
16BEEE303	Electromagnetic Theory (HC)	PC	1	a,b,c,d,e,j	3	0	0	3	40	60	100	3		
16BEEE304	Electronic Devices and Circuits	PC	2	a,b,c,d,e, 1	3	0	0	3	40	60	100	3		
16BEEE305A/ 16BEEE305B	Renewable Energy Sources/ Power Plant Engineering(CHOICE BASED)	ES	1	a,b,c,d,e,g, l	3	0	0	3	40	60	100	3		
PRACTICAL			•											
16BEEE311	Electrical Machines – I Laboratory	PC	1	a,d,e,k,l	0	0	3	2	40	60	100	3		
16BEEE312	Electronic Devices and Circuits Laboratory	PC	2	a,d,e,k,l	0	0	3	2	40	60	100	3		
16BEEE313	Basic Simulation Laboratory for Electrical Systems	ES	1	a,d,e,j,k,l	0	0	3	2	40	60	100	3		
TOTAL					15	2	9	22	320	480	800	26		

16BEEE351*	Introduction to Solar PV Design	MC	1,2	a,b,c,d,e ,l	1	0	0	-	100*	-	-	1	
Total Contact Hours/Week =27 Hours													

SEMESTER IV

			SEM	IESTER 4								
COURSE CODE	COURSETITLE	SUB AREA	PEO	РО	L	Т	P	C	CIA	ESE	TOTAL	CONTACT HOURS/ WEEK
THEORY												
16BEEE401	Electrical Machines - II(HC)	PC	1	a,b,c,d,e g,l	3	2	0	4	40	60	100	5
16BEEE402	Transmission and Distribution Systems (HC)	PC	1	a,b,c,d,e g,l	3	0	0	3	40	60	100	3
16BEEE403A/ 16BEEE403B	Measurements and Instrumentation /Transducer Engineering (SC) (CHOICE BASED)	PC	1	a,b,c,d,e,l	3	0	0	3	40	60	100	3
16BEEE404	Pulse and Digital Logic Circuits (HC)	PC	2	a,b,c,e,	3	0	0	3	40	60	100	3
16BEEE405A/ 16BEEE405B	BasicThermodynamics and Energy Conversion Devices / Engineering Materials (CHOICEBASED)	ES	1,2	a,b,c,d,e,g, 1	3	0	0	3	40	60	100	3
PRACTICAL												
16BEEE411	Electrical Machines Laboratory –II	PC	1	a,b,c,d,e,l	0	0	3	2	40	60	100	3
16BECC412	Scientific Computing Laboratory	BS	2	a,b,c,e	0	0	2	2	40	60	100	3
16BEEE413	Measurements and Instrumentation Laboratory	PC	1	a,d,e,j,k,l	0	0	3	2	40	60	100	3
TOTAL					15	2	8	22	320	480	800	26

16BEEE451*	Electricity Standards	MC	1,2	a,b,c,d,e ,l	1	0	0	-	100*	-	-	1
		Total Co	ntact I	Hours/Wee	k =2'	7 Ho	ours					

SEMESTER V

	SEMESTER 5														
COURSE CODE	COURSETITLE	SUB AREA	PEO	PO	L	T	Р	C	CIA	ESE	TOTAL	CONTACT HOURS/ WEEK			
THEORY															
16BEEE501	Power Electronics(HC)	PC	2	a,b,c,d, e,g	3	0	0	3	40	60	100	3			
16BEEE502	Power System Analysis(HC)	PC	2	a,d,e	3	2	0	4	40	60	100	5			
16BEEE503	Control System Engineering (HC)	PC	1	a,b,c,d,e,l	3	2	0	4	40	60	100	5			
16BEEE5E	Professional Elective-I (CHOICE BASED)	PE	-	-	3	0	0	3	40	60	100	3			
16BEEE5E	Professional Elective- II (CHOICE BASED)	PE	-	-	3	0	0	3	40	60	100	3			
PRACTICAL															
16BEEE511	Power Electronics Laboratory	PC	2	a,c,d,j,k,l	0	0	3	2	40	60	100	3			
16BEEE512	Analog and Digital Circuits Laboratory	PC	2	a,d,e,k,l	0	0	3	2	40	60	100	3			
16BEEE513	Control System Engineering Laboratory	PC	1	c,d,e,f,i,j	0	0	3	2	40	60	100	3			
TOTAL					15	4	9	23	320	480	800	28			

16BEEE551*	In plant Training	MC	-	-	-	0	0	-	100*	-	-	-	
16BEEE552*	Control and Maintenance for Electrical Motors/ Programmable Logic Controller (PLC)	MC	1,2	a,b,d,e,l	1	0	0	-	100*	-	-	1	
	Total Contact Hours/Week =29 Hours												

SEMESTER VI

	SEMESTER 6 COURSE GOUDGDIMINED SUB PO GOUDGDIMINED CONTACT														
COURSE CODE	COURSETITLE	SUB AREA	PEO	РО	L	Т	Р	C	CIA	ESE	TOTAL	CONTACT HOURS/W EEK			
THEORY															
16BEEE601	Solid State Drives(HC)	PC	2	a,b,c,d,e, g	3	0	0	3	40	60	100	3			
16BEEE602	Power System Operation and Control (HC)	PC	2	a,b,c,d,e, g,l	3	0	0	3	40	60	100	3			
16BEEE603A/ 16BEEE603B	Microprocessor and Microcontroller / Microprocessor based system design (SC) CHOICE BASED	PC	1	a,b,c,e,h, k,l	3	0	0	3	40	60	100	3			
16BEEE604	Design of Electrical Apparatus(HC)	PC	1	a,c,d,g,l	3	0	0	3	40	60	100	3			
16BEEE6E	Professional Elective- III (CHOICE BASED)	PE	-	-	3	0	0	3	40	60	100	3			
16BEEE6E	Professional Elective- IV (CHOICE BASED)	PE	-	-	3	0	0	3	40	60	100	3			
PRACTICAL						-									
16BEEE611	Micro Processor and Micro Controller Laboratory	PC	2	a,c,d,j,k,l	0	0	3	2	40	60	100	3			
16BEEE612	Electrical Estimation and Rewinding Laboratory	PC	1,2	a,c,d,e,f,g	0	0	3	2	40	60	100	3			
TOTAL					18	0	6	22	320	480	800	24			

16BEEE651*	PCB Design and Servicing of Domestic Appliances	MC	1,2	a,b,d,e,l	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =25 Hours												

SEMESTER VII

			SEM	ESTER 7	,							
COURSE CODE	COURSETITLE	SUB AREA	PEO	РО	L	T	Р	C	CIA	ESE	TOTAL	CONTACT HOURS/W EEK
THEORY												
16BECC701	Professional Ethics, Principle of Management and Entrepreneurship Development	HS	1	a,b,d,e,f, g,i	3	0	0	3	40	60	100	3
16BEEE702	Power System Protection and Switchgear(HC)	PC	2	a,b,c,d,e, g,l	3	0	0	3	40	60	100	3
16BEEE7E	Professional Elective- V(CHOICE BASED)	PE	-	-	3	0	0	3	40	60	100	3
	Open Elective-I (CHOICE BASED)	OC	-	-	3	0	0	3	40	60	100	3
	Open Elective - II (CHOICEBASED)	OC	-	-	3	0	0	3	40	60	100	3
PRACTICAL												
16BEEE711	Power System Simulation Laboratory	PC	1	a,c,d,j,k,l	0	0	3	2	40	60	100	2
16BEEE791	Project work- Phase- I	PW	1,2	-	0	0	8	4	40	60	100	8
TOTAL	<u>.</u>				15	0	11	21	280	420	700	25

16BEEE751*	ETAP and PSCAD	MC	1,2	a,b,d,e,l	1	0	0	-	100*	-	-	1
		Total Co	ntact H	Hours/Weel	x =20	6 H	ours					

SEMESTER VIII

			SEM	ESTER 8	3							
COURSE CODE	COURSETITLE	SUB AREA	PEO	PO	L	T	Р	C	CIA	ESE	TOTAL	CONTACT HOURS/W EEK
THEORY												
16BECC801A/ 16BECC801B	Energy Management, Utilization and Auditing/ Smart Grid (SC) CHOICE BASED	PC	2	b,e,f,g,h, i,j	3	0	0	3	40	60	100	3
16BEEE8E	Professional Elective- VI(CHOICE BASED)	PE	-	-	3	0	0	3	40	60	100	3
PRACTICAL			1	T								
16BEEE891	Project work -Phase - II & Viva-Voce	PW	1,2	-	0	0	32	16	120	180	300	32
TOTAL					6	0	32	22	200	300	500	38
	,	Total Cor	ntact Ho	ours/Week	x =38	8 Ho	ours					

L:Lecture HourT:Tutorial HourCIA:P:Practical HourC: No. of CreditsESE: End Semester ExaminationV A C: Value Added CourseESE: End Semester Examination

Total Credits earned: 23+24+22+22+23+22+21+22=179

against the specified range -[175-190 Credits]

* Credits for **Mandatory Courses (MC)** are not counted for computation of CGPA. The passing minimum for **Mandatory Courses (MC)** is 50 marks out of 100 Marks. There will be two tests, of which one will be class test covering 50% of syllabus for 50 marks and other class test covering next 50% of syllabus for 50 marks. [Total 50+50=100Marks].

Interested students can opt one self study course in the Seventh semester from open electives which will be reflected in the mark sheets, only if he/she passes in the course.

LIST OF PROFESSIONAL ELECTIVES

	PROFESS	SIONAL ELECTIVE-I A	ND P	ROFESS	SION	AL E	LECI	TIVE-I	I VSEM	IESTER	
S. No	SUB. CODE	TITLE OF THE COURSE	PE O	PO	L	Т	Р	С	CIA	ESE	TOTAL
1	16BEEE5E01	Network Analysis and Synthesis	2	a,d,e	3	0	0	3	40	60	100
2	16BEEE5E02	Advanced Control System	2	b,c,h,i	3	0	0	3	40	60	100
3	16BEEE5E03	Electric Hybrid Vehicle	2	a,c,d,h	3	0	0	3	40	60	100
4	16BEEE5E04	Communication Engineering	1	-	3	0	0	3	40	60	100
5	16BEEE5E05	Introduction to Neural Networks	1	a,c,e,g,l	3	0	0	3	40	60	100
6	16BEEE5E06	Computer Architecture	1	a,c,e	3	0	0	3	40	60	100
7	16BEEE5E07	Fuzzy Logic and its applications	1	a,c,e,n	3	0	0	3	40	60	100
8	16BEEE5E08	Distributed Generation	2	c,d,e,g, h,i	3	0	0	3	40	60	100
9	16BEEE5E09	Digital Signal Processing	1	a,b,c,d,e, g,l,m	3	0	0	3	40	60	100
10	16BEEE5E10	Industrial Automation	1	a,c,d,e, k,m,n	3	0	0	3	40	60	100
11	16BEEE5E11	Sensor and Transducer	1	a,b,c,e,i	3	0	0	3	40	60	100
12	16BEEE5E12	Intellectual Property Rights	1	h,j,l	3	0	0	3	40	60	100
	PROFESSI	ONAL ELECTIVE-III A	ND P	ROFES	SION	AL I	ELEC	FIVE-l	IV VI SI	EMESTI	ER
13	16BEEE6E01	Computer Organization and Architecture	1	a,c,e	3	0	0	3	40	60	100
14	16BEEE6E02	Embedded System	1	-	3	0	0	3	40	60	100
15	16BEEE6E03	ProgrammableLogicControlleranditsApplication	1,2	a,b,d,e,l	3	0	0	3	40	60	100

16	16BEEE6E04	Computer Networks	1	a,c,e	3	0	0	3	40	60	100
17	16BEEE6E05	High Voltage Engineering	2	a,b,c,d,e, g,l	3	0	0	3	40	60	100
18	16BEEE6E06	Special Electrical Machines	2	a,c,d,e,h	3	0	0	3	40	60	100
19	16BEEE6E07	Fibre Optics and Laser Instruments	1	a,b,e,k,l, m	3	0	0	3	40	60	100
20	16BEEE6E08	Mobile Communication	1	a,b,d,e	3	0	0	3	40	60	100
21	16BEEE6E09	Switched Mode Power Conversion	2	a,c,e	3	0	0	3	40	60	100
22	16BEEE6E10	Biomedical Instrumentation	1,2	a,c,d,e,f, m,n	3	0	0	3	40	60	100
23	16BEEE6E11	Modern semiconductor Devices	2	a,c,d,e,g	3	0	0	3	40	60	100
		PROFESS	SION	AL ELEO	CTIV	E-V V	II				
				SEMES	TER						
24	16BEEE7E01	Artificial Intelligence and Expert Systems	2	a,c,e	3	0	0	3	40	60	100
25	16BEEE7E02	HVDC and EHVAC	2	a,b,c,h,i, l	3	0	0	3	40	60	100
26	16BEEE7E03	Power System Economics	2	a,c,e	3	0	0	3	40	60	100
27	16BEEE7E04	Power System Restructuring and Deregulation	2	a,c,e,j,k, l	3	0	0	3	40	60	100
28	16BEEE7E05	Power Quality	2	a,c,d,e,h, l	3	0	0	3	40	60	100
29	16BEEE7E06	Power System Dynamics	2	a,c,e	3	0	0	3	40	60	100
30	16BEEE7E07	ComputerAidedAnalysis and Design ofElectrical Apparatus	1	a,c,d,g	3	0	0	3	40	60	100
31	16BEEE7E08	Digital System Design using VHDL	1	a,c,e,h,l	3	0	0	3	40	60	100
32	16BEEE7E09	Optimization Techniques	2	a,c,e	3	0	0	3	40	60	100
33	16BEEE7E10	Real Time Operating System	1	a,c,e.j.l, n	3	0	0	3	40	60	100
34	16BEEE7E11	Advances in Soft Computing	1	a,c,e	3	0	0	3	40	60	100

		PROFESSIO	NAL E	LECTIVE	-VI	VIII	SEN	(EST)	ER		
35	16BEEE8E01	Flexible AC Transmission Systems	2	a,b,c,e,j,l	3	0	0	3	40	60	100
36	16BEEE8E02	Power System Stability	2	d,e	3	0	0	3	40	60	100
37	16BEEE8E03	Power Generation Systems	2	c,d,e,g,h,i	3	0	0	3	40	60	100
38	16BEEE8E04	Total Quality Management	1	b,e,f,g,h,i,j	3	0	0	3	40	60	100
39	16BEEE8E05	Virtual Instrumentation	1	a,b,e,h,l,m, n	3	0	0	3	40	60	100
40	16BEEE8E06	Robotics and Automation	1	a,c,e,m,n	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVES

	List of Open Electives offered by Other Departments										
		Science& H	[uma	nities							
SL. No.	SUB. CODE	TITLE OFTHE COURSE	PE O	РО	L	Т	Р	С	CIA	ESE	TOTAL
1	16BESHOE01	Probability and Random Process	1,2	a,c,d,h, j	3	0	0	3	40	60	100
2	16BESHOE02	Fuzzy Mathematics	1	a,b,c	3	0	0	3	40	60	100
3	16BESHOE03	Linear Algebra	1	a,g,h,j	3	0	0	3	40	60	100
4	16BESHOE04	Engineering Acoustics	1,2	a,b, g,h,j	3	0	0	3	40	60	100
5	16BESHOE05	Solid Waste Management	1,2	a,b,c,g	3	0	0	3	40	60	100
6	16BESHOE06	Green Chemistry	1,2	a,b,c,g	3	0	0	3	40	60	100
7	16BESHOE07	Applied Electrochemistry	1,2	a,b,c,	3	0	0	3	40	60	100
8	16BESHOE08	Industrial Chemistry	1,2	a,b,c,	3	0	0	3	40	60	100
		Computer Scien	ce Ei	ngineeri	ing			1			I
10	16BECSOE01	Internet Programming	1,2	a,b,c,g, h	3	0	0	3	40	60	100
11	16BECSOE02	Multimedia and Animation	1,2	a,b,c,g, h,j	3	0	0	3	40	60	100
12	16BECSOE03	PC Hardware and Trouble shooting	1	a,b,c,d ,j	3	0	0	3	40	60	100
13	16BECSOE04	Java Programming	1,2	a,b,c,d,	3	0	0	3	40	60	100
		Electronics and Communic	ation	Engine	eeri	ng					
14	16BEECOE01	Real Time Embedded Systems	1,2	a,b,c,d	3	0	0	3	40	60	100
15	16BEECOE02	Consumer Electronics	1	a,b,c,j	3	0	0	3	40	60	100
16	16BEECOE03	Neural Networks and its Applications	1	a,b,c,d	3	0	0	3	40	60	100

17	16BEECOE04	Fuzzy Logic and its	1,	2 a,d,g,	3	0	0	3	40	60	100
		Applications		h,j							
		Bio Teo	chnol	ogy							
	16BTBTOE01	Bioreactor Design	1,2,	a,b,c,	3	0	0	3	40	60	100
18											
19	1 (DEDEODO	Food Processing	1,2	a,b,d	2	0	0	2	40	(0)	100
	16BTBTOE02	and Preservation			3	0	U	3	40	00	100
20	16PTPTOE02	Pasia Disinformatica	1	a,b,c,	3	0	0	3	40	60	100
20	TOBTBTOLOS	Fundamentals of	1	abcdg							
21	16BTBTOE04	Nara Distachaslasy	1	h,j	3	0	0	3	40	60	100
		Nano Biotechnology									
		Mechanical	Engi	ineering							
						1		1		[Г
22	16BEMEOE01	Computer Aided Design	1	a,b,c,d	3	0	0	3	40	60	100
22		Industrial Safety	1	abdg							
23	16BEMEOE02	and Environment		<i>a,0,</i> 4,5	3	0	0	3	40	60	100
24	16BEMEOE03	Transport Phenomena	1.2	a,b,c,d	3	0	0	3	40	60	100
		1			5	Ŭ				00	100
		Introduction to	1,2	a,b,c,d,g	~		6		10	<i>(</i>)	100
25	16BEMEOE04	Biomechanics		,h,j	3	0	0	3	40	60	100
		Automobile	Engi	ineering							
30		Automobile Engineering	1,2	a,b,d,g	3	0	0	3	40	60	100
	IOBEAEUEUI			_							
21		Basics of Two and Three	1,2	a,b,d,	2	0		2	40	60	100
51	16BEAEOE02	Wheelers			3	U	U	5	40	60	100

32	16BEAEOE03	Automobile Maintenance	1	a,b,c	3	0	0	3	40	60	100
33	16BEAEOE04	Introduction to Modern Vehicle Technology	1,2	a,b,c	3	0	0	3	40	60	100
		Civil En	gineer	ing							
34	16BECEOE01	Housing, Plan and Management	1,2	a,b,c,d	3	0	0	3	40	60	100
35	16BECEOE02	Building Services	1,2	a,b,c,d	3	0	0	3	40	60	100
36	16BECEOE03	Management of Irrigation Systems	1,2	a,b,c, d	3	0	0	3	40	60	100
37	16BECEOE04	Advanced Construction Technology	1,2	a,b,d	3	0	0	3	40	60	100
		List of Electives Offere	d to O	ther De	par	tme	nts				
		Electrical and Elec	tronic	s Engin	eeri	ng					
38	16BEEEOE01	Electric Hybrid Vehicle	2	a,c,d ,h,m ,n	3	0	0	3	40	60	100
39	16BEEEOE02	Energy Management and Energy Auditing	2	b,e,f,g, h,i,j,n	3	0	0	3	40	60	100
40	16BEEEOE03	Programmable Logic Controller	1,2	a,b, d,e,l	3	0	0	3	40	60	100
41	16BEEEOE04	Renewable Energy Resources	1	a,b,c,d, e,g,l	3	0	0	3	40	60	100

SL. NO.	COURSE WORK- SUBJECT AREA	AREA CODE
1	Humanities and social science including management	HS
2	Basic sciences including maths, physics, chemistry and biology	BS
3	Engineering science including materials, Workshop, Drawing, Basic of Electrical/ Electronics/ Mechanical/ Computer/civil/ instrumentation	ES
4	Professional core course relevant to the chosen branch (Must be split into Hard Core (HS)(no choice) and Soft Core (SC) (with choice))	PC
5	Professional Electives	PE
6	Open Electives	OC
7	Project work, seminar and internship	PW
8	Mandatory Courses(Value addition)	MC

**--Skill Development
**--Employability
**--Entrepreneurship

Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining а to Electronics and Instrumentation Engineering. Identify and formulate Electrical and Electronics Engineering problems from research literature and be ability b to analyze the problem using first principles of Mathematics and Engineering Sciences. Come out with solutions for the complex problems and to design system components or process that fulfill the с particular needs taking into account public health and safety and the social, cultural and environmental issues. Draw well-founded conclusions applying the knowledge acquired from research and research methods d including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significant conclusion. Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities e like electronic prototyping, modeling and control of systems and also being conscious of the limitations. Understand the role and responsibility of the Professional Electrical and Electronics Engineer and to assess f societal, health, safety issues based on the reasoning received from the contextual knowledge. Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit g the knowledge and the need for Sustainable Development. Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge h ethical responsibilities. Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinary i projects. Communicate efficiently the engineering facts with a wide range of engineering community and others, to i understand and prepare reports and design documents; to make effective presentations and to frame and follow instructions. Demonstrate the acquisition of the body of engineering knowledge and insight and Management Principles and k to apply them as member / leader in teams and multidisciplinary environments. Recognize the need for self and life-long learning, keeping pace with technological challenges in 1 the broadest sense.

PROGRAM OUTCOMES: On successful completion of the programme,

PROGRAM SPECIFIC OUTCOMES:

m	Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems
	pertaining to Electronics and Instrumentation Engineering
n	Identify and formulate Electrical and Electronics Engineering problems from research literature and be
	able to analyze the problem using first principles of Mathematics and Engineering Sciences.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1	Have successful technical and professional careers in their chosen fields such as circuit theory, Field theory, control
	theory and computational platforms.
PEO 2	Engross in life long process of learning to keep themselves abreast of new developments in the field of
	Electronics and their applications in power engineering

MAPPING

PROGRAMME EDUCATIONA]	PROG	GRAM	OUT	COMI	ES & 1	PROG	RAM	SPECI	FIC O	UTCO	MES	
L OBJECTIVES	a	b	c	d	e	f	g	h	i	j	k	1	m	1
1	\checkmark					\checkmark	✓	✓						
2	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark		✓			\checkmark	✓

SEMESTER I

16BECC101COMMUNICATIVE ENGLISHL T P C3 0 0 3

Course Objectives:

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.
- To study formal context

Course Outcomes :

Students undergoing this course will be able to

- Use English language for communication: verbal & non –verbal.
- Enrich comprehension and acquisition of speaking & writing ability.
- Gain confidence in using English language in real life situations.
- Improve word power: lexical, grammatical and communication competence.
- Acquire good vocabulary for easy communication.
- Be familiar with sentence structure and sentence formation

Unit I

Listening – Types of listening - Listening to class reading - Video tapes/ Audio tapes. Speaking – Introduction on self - Introduction on one's friend. Reading - Reading for comprehension – Reading different kind of passages like descriptive, narrative, objective, conversational and argumentative. Writing – Formal and Informal letters- Free writing on any topic –My favorite place, hobbies, dreams, goals, etc- - To fill in different application forms. Grammar – Articles- WH questions –Yes/No Question - Subject Verb agreement. Vocabulary - Word Formation – Word expansion (Root word) - Prefix and Suffix.

Unit II

Listening – Understanding the passage in English –Pronunciation practice. Speaking – Asking

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and answering questions - Telephone etiquette. **Reading** – Critical reading – Finding key information in a given text (Skimming - Scanning). **Writing**– Coherence and cohesion in writing – Short paragraph writing – Writing short messages. **Grammar** – Parts of speech – Noun – Verb – Adjectives - Adverbs. **Vocabulary** – Compound Nouns/Adjectives – Irregular verbs.

Unit III

Listening – Listening for specific task – Fill in the gaps. Speaking – Phonemes – Syllables – Role play – Conversation Practice. Reading – Reading and Comprehension. Writing -Autobiographical writing – Biographical writing - Instruction writing. Grammar – Preposition – Infinitive – Gerund – Tenses. Vocabulary – Foreign words used in English – British and American usage.

Unit IV

Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate- Presentations in seminars. **Reading** – Making inference from the reading passage – Predicting the content of reading passages. **Writing** - Interpreting visual materials (tables, graphs, charts, etc) Letters to the Editor. **Grammar** – Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

Unit V

Listening - Listening to different accents, speeches/presentations. **Speaking**- Extempore talk – Just-a-minute talk. **Reading**-Reading strategies–Intensive reading – Text analysis. **Writing** - Creative writing – Writing circulars and notices – Writing proposal. **Grammar** – Direct and Indirect speech – Conditional sentences - Auxiliary verbs. **Vocabulary** – Abbreviations & Acronyms.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

TOTAL:45 HOURS

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TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	<u>Sangeeta</u> <u>Sharma</u> , <u>Meenakshi</u> <u>Raman</u>	<u>Technical</u> <u>Communication:</u> <u>Principles And Practice</u> 2 nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
		BOOK		PUBLICATION
1	Lakshminarayanan,	Communication	SCITECH Publications,	2009
	K.R. & Murugavel, T.	Skills for Engineers	Chennai	
2	Rizvi Ashraf, M	Effective Technical	Tata McGraw-Hill,	2007
		Communication	New Delhi.	
3	Rutherford Andrea, J.	Basic	Pearson Education, New	2006
		Communication	Delhi.	
		Skills for		
		Technology		

WEBSITES:

- 1.<u>www.learnerstv.com</u> Listening/ Speaking/ Presentation
- 2.<u>www.usingenglish.com</u> Writing/ Grammar
- 3.<u>www.englishclub.com</u> Vocabulary Enrichment/ Speaking
- 4.<u>www.ispeakyouspeak.blogspot.com</u> Vocabulary Enrichment/ Speaking
- 5.<u>www.teachertube.com</u> Writing Technically
- 6.www.Dictionary.com Semantic / Grammar

Course Objectives:

- 1. To develop analyzing skills for solving different engineering problems.
- 2. To understand the concept of Matrices.
- 3. To remember the basics of differential calculus and its applications.
- 4. To apply the problems in differential equations.
- 5. To Create knowledge about functions of several variables and Sequence
- 6. To study the algebraic manipulation

Course Outcomes:

The student will be able to

- Acquire the basic knowledge and understanding of mathematics
- Apply advanced matrix knowledge to engineering problems.
- Improve their ability in evaluating geometrical applications of differential calculus problems.
- To solve the problems by applying the differential Equations.
- Evaluating engineering problems involving functions of several variables.
- Understand the concepts of sequences and series.

UNIT I MATRICES

Review of Matrix Algebra - Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction to canonical form through orthogonal reduction.

UNIT II DIFFERENTIAL CALCULUS

Overview of Derivatives - Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes- Evolutes as Envelope of normals – Maxima and Minima of functions of two or more Variables – Method of Lagrangian Multipliers

UNIT III DIFFERENTIAL EQUATIONS

Linear Differential equations of second and higher order with constant coefficients - Euler's form of Differential equations – Method of variation parameters.

UNIT -IV FUNCTIONS OF SEVERAL VARIABLES

Partial derivatives – Euler's theorem for homogeneous functions – Total derivatives – Differentiation of implicit functions – Jacobians – Maxima and Minima of functions of two or more

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Variables - Method of Lagrangian multipliers.

UNIT V SEQUENCES AND SERIES

Sequences: Definition and examples – **Series:** Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.

TOTAL: 60 HOURS

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TEXT BOOKS:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics	McGrawHillEducation(India)Private Limited, New	2014
			Delhi.	
2	Sundaram, V. Lakhminarayan,K.A. & Balasubramanian,R.	Engineering Mathematics for first year.	Vikas Publishing Home, New Delhi.	2006

REFERENCES:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Grewel . B. S.	Higher Engineering Mathematics	Khanna Publications, New Delhi.	2014
2	Bhaskar Rao. P. B, Sri Ramachary SKVS, Bhujanga Rao. M	Engineering Mathematics I	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
4	Shahnaz Bathul	TextbookofEngineeringMathematics(SpecialFunctionsandComplex Variables)	PHI Publications, New Delhi.	2009

5	Michael D.	Advanced	Pearson Education, India	2009
	Greenberg	Engineering		
		Mathematics		

WEBSITES :

- 1. www.efunda.com
- 2. www.mathcentre.ac.uk
- 3. www.intmath.com/matrices-determinants
- 4. www. Intmath.com/calculus/calculus-intro.php

16BEPH103ENGINEERING PHYSICSL T P C3 0 0 3

Course Objectives:

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
- Understand the basics of laser and optical fiber with appropriate applications.
- Introduce the concepts of quantum mechanics for diverse applications.
- Impart the basic knowledge of crystal and its various crystal structures.
- Disseminate the fundamentals of nuclear physics and their applications.
- To study the quantum mechanics.

Course Outcomes:

Upon completion of this course, the students will be able to

- Identify the elastic nature of materials and its thermodynamic properties.
- Infer the characteristics of laser and optical fibers for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Identify the different atomic arrangements of crystals and its defects
- Make use of the concepts of sound waves for medical applications
- Illustrate the basic ideas of nuclear reactors for energy resources

UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS

Three types of modulus of elasticity – basic definitions, relation connecting the moduli (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bending Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER -CO₂, Semiconductor LASER- Applications of LASER in industry and medicine. Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber

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optical communication system (block diagram)

UNIT III QUANTUM PHYSICS

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electron microscope.

UNIT IV CRYSTAL PHYSICS

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEAR PHYSICS

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition –Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

TOTAL: 45 HOURS

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641	2015

REFERENCES:

S.NO	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
	NAME	BOOK		PUBLICATION
1	Serway and Jewett	Physics for Scientists	Thomson	2010
		and Engineers with	Brooks/Cole, Indian	
		Modern Physics	reprint, New Delhi	
2	Gaur, R.K. and	Engineering Physics	Dhanpat Rai	2011
	Gupta, S.C		Publications,New	
			Delhi.	
3	M.N. Avadhanulu	A Text book of	S.Chand and	2011
	and PG Kshirsagar	Engineering Physics	company, Ltd., New	
			Delhi	

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4	D.C. Ghosh, N.C.	Engineering Physics	University Science,	2011
	Ghosh, P.K.		New Delhi	
	Haldar			
5	P. Khare, A.	Engineering Physics:	Jones & Bartlett	2009
	Swarup	Fundamentals and	Learning	
		Modern Applications		

WEBSITES:

- 1. www.nptel.ac.in
- www.physicsclassroom.com
 www.oyc.yale.edu
 www.physics.org

16BECH103

Course Objectives:

- To gain knowledge on adsorption phenomena.
- To make the students conversant with basics of water technology.
- To make the student acquire sound knowledge of electrochemistry and storage devices.
- To acquaint the student with concepts of fuels and rocket propellants.
- To develop an understanding of the basic concepts of corrosion science.
- To acquaint the students with the basics of surface chemistry

Course Outcomes:

At the end of this course, students will be able to

- Outline the basic principles of chemistry for water treatment (K)
- Examine the electrochemical properties to design non conventional energy storage devices (S)
- Apply the concepts combustion of different fuels (S)
- Identify the concepts of corrosion and its protection in the engineering field (S)
- Apply the concepts of surface chemistry in the field of engineering (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I WATER TECHNOLOGY

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverse osmosis.

UNIT II ELECTROCHEMISTRY AND STORAGE DEVICES

Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - $Fe^{2+}vs$ dichromate) –Electrolytic conductance-application (conductometric titration)-Batteries-Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell-H₂-O₂ Fuel Cell.

UNIT III FUELS AND COMBUSTION

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method -

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Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel-Introduction-GCV-NCV-Flue gas analysis.

UNIT IV CORROSION SCIENCE

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings - Organic coatings-Paints - Constituents and functions –Inorganic coatings- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hot dipping.

UNIT V SURFACE CHEMISTRY AND PHASE RULE

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening).Phase Rle: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

TOTAL-: 45 HOURS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

TEXT BOOKS:

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3 rd Reprint NewDelhi.	2013

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2.	Kuriakose. J.C.	Chemistry in Engineering and	Tata McGraw Hill Publishing	2010
	and Rajaram	Technology. Vol. I & II	Company, New Delhi.	
		5 th edition.		
3.	Jain, P.C. and	Engineering Chemistry.	Dhanpat Rai	2009
	Monika Jain		Publishing Company (P) Ltd., New Delhi.	
4.	Dara.S.S	Text book of Engineering	S.Chand & Co.Ltd., New	2008
		Chemistry.	Delhi	
5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P)	2001
			Ltd., Meerut	

WEBSITES:

- 1. http://www.studynotes.ie/leaving-cert/chemistry/
- 2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html
- 3. http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
- 4. http://ocw.mit.edu/courses/#chemistry
- 5. http://www.chem.qmul.ac.uk/surfaces/sec

16BEEE104 BASIC ELECTRICAL ENGINEERING

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Course Objectives

- To impart the basic knowledge about the DC Electric circuits.
- To study the working of various Electrical Machines.
- To study the basic concepts of Electrical safety and wiring
- To get the knowledge of Magnetic circuits and its properties
- To impart the basic knowledge about the DC Electric circuits.
- To study the basic of power system

Course Outcomes:

At the end of this course, students will be able to

- 1. To understand and analyze basic electric and magnetic circuits.
- 2. Attributing the electric circuits with DC and AC excitation by applying various circuit laws.
- 3. Attributing the electrical machines and transformer.
- 4. Evaluate the various digital circuits in real time applications.
- 5. Analysis various semiconductor devices in real time applications.
- 6. Reproduce the Measuring Instruments and Electrical Installation.

UNIT I – FUNDAMENTALS OF DC CIRCUITS

Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor, Kirchhoff's laws, Mesh analysis, Nodal analysis –equivalent resistor, current division, voltage division

UNIT II – MAGNETIC CIRCUITS

Introduction to magnetic circuits-Simple magnetic circuits-Faraday's laws, Lenz law-Flemings rules - induced emfs and inductances-self and mutual inductance.

UNIT III – AC CIRCUITS (Elementary treatment only)

Generation of AC, Average and RMS values, Form and peak factors, concept of phasor representation, J operator – representation of AC in rectangular and polar form – power and power factor - Introduction to three phase systems - types of connections, relationship between line and phase values.

UNIT IV-ELECTRICAL MACHINES (Elementary treatment only)

Working principle, construction, types and applications of DC machines and AC machines –single phase transformers - single phase induction motors: capacitor start and capacitor start & run motors

UNIT V-ELECTRICAL SAFETY, WIRING AND INTRODUCTION TO POWER SYSTEM 9

Safety measures in electrical system- types of wiring- wiring accessories staircase, fluorescent lamps & corridor wiring- Basic principles of earthing-Types of earthing- protection devices MCB- Fuses and its types –calculation of fuses.

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Dash.S.S,Subramani. C,Vijayakumar.K	Basic Electrical Engineering	First edition, Vijay Nicole Imprints Pvt.Ltd	2013

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	SmarajtGhosh	Fundamentals of Electrical & Electronics Engineering	Second edition, PHI Learning	2007
2	Metha.V.K, RohitMetha	Basic Electrical Engineering	Fifth edition,Chand.S& Co	2012
3	Kothari.D.P and Nagrath.I.J	Basic Electrical Engineering	Second edition,Tata McGraw - Hill	2012
4	Bhattacharya.S.K	Basic Electrical and Electronics Engineering	First edition, Pearson Education	2011

WEBSITES

1.www.nptel.com 2.www.electrical4u.com

16BEEE105 BASIC ELECTRONICS ENGINEERING

Course Objectives

- To impart the basic knowledge about the basic electronic components.
- To get the operation and characteristics of various semiconductor devices.
- To get the operation and characteristics of various transducers.
- To study the OPTO electronic devices
- To study the different operation of OPTO devices
- To understand the basic concepts of digital electronics.

Course Outcomes:

The students shall develop an

- Intuitive understanding of basic electronic components,
- Intuitive understanding of basic concepts of semiconductor devices,
- Intuitive understanding of basic concepts of Transducers.
- Intuitive understanding of basic concepts of digital electronics
- Able to apply them in practical situation.
- Analysis the real time application of it.

UNIT I- ELECTRONIC COMPONENTS

Passive components – resistors, capacitors and inductors -properties, common types, I-V relationship and uses.

UNIT II- SEMICONDUCTOR DEVICES

Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET.

UNIT III – OPTOELECTRONIC DEVICES

LED, LCD, LDR, Photodiode, Phototransistor, Solar cell, Opto couplers

UNIT IV- TRANSDUCERS

Transducers - Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.

UNIT V- DIGITAL ELECTRONICS

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Thyagarajan.T, SendurChelvi.K.P, Rangaswamy.T.R	Basics:Electrical, Electronics and Computer Engineering	New Age International,Third Edition	2007
2	SomanathanNair.B, Deepa.S.R	Basic Electronics	I.K. International Pvt.Ltd	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Thomas L. Floyd	Electronic Devices	Pearson Education, 9th Edition	2011
2	Rajput.R.K	Basic Electrical and Electronics Engineering	LaxmiPublications, First Edition	2007

WEBSITES

1. www.nptel.com 2.www.electrical4u.com

16BEPH111 ENGINEERING PHYSICS LABORATORY L T P C 0042

Course Objective

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- To learn the band gap of semiconductor

Course Outcome

- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Prepare for the lab experiment and perform individually a wide spectrum of experiments.
- Present experimental data in various appropriate forms like tabulation, and plots.
- Analyze, Interpret and Summarize experimental results.
- Communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- Prepare to develop the skills for understanding basic electric

LIST OF EXPERIMENTS – PHYSICS

- 1. Determination of velocity of sound and compressibility of liquid Ultrasonic interferometer.
- 2. Determination of wavelength of mercury spectrum spectrometer grating.
- 3. Determination of Young's modulus of the material Non uniform bending (or) Uniform bending.
- 4. Determination of Viscosity of liquid Poiseuille's method.
- 5. Spectrometer Dispersive power of a prism.
- 6. Torsional pendulum Determination of Rigidity modulus.
- 7. Particle size determination using Diode Laser
- 8. Determination of Laser parameters Wavelength, and angle of divergence.
- 9. Determination of acceptance angle in an optical fiber.
- 10. Determination of thickness of a thin wire Air wedge method
- 11. Determination of Band Gap of a semiconductor material.
- 12. Determination of Specific resistance of a given coil of wire Wheatstone Bridge

Course Objective

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To estimate the amount of alkalinity ions, hardness, chloride in water sample
- To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
- To acquaint the students with the determination of molecular weight of a polymer by viscometry
- To carried out different types of titrations for estimation of concerned

Course Outcome

- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
- Estimate the amount of alkalinity ions, hardness, chloride in water sample
- Measure molecular/system properties of conductance of solutions, EMF etc
- Acquaint the students with the determination of molecular weight of a polymer by visocometry
- Determine the corrosion rate of steel by weight loss method.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more qualities and quantities of materials involved for accurate results.

LIST OF EXPERIMENTS – CHEMISTRY

- 1. Estimation of alkalinity of Water sample.
- 2. Estimation of hardness of Water by EDTA
- 3. Estimation of chloride in Water sample (Argentometric method)
- 4. Determination of corrosion rate by weight loss method.
- 5. Conductometric Titration (Simple acid base).
- 6. Conductometric Titration (Mixture of weak and strong acids).
- 7. Conduct metric Titration using BaCl₂ vs Na₂ SO₄.
- 8. pH Titration (acid & base).
- 9. Potentiometric Titration (Fe²⁺ / KMnO₄ or K₂Cr₂O₇).
- 10. Estimation of Ferric ion by Spectrophotometry.
- 11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
- 12. Determination of molecular weight and degree of polymerization using Viscometry.
- 13. Determination of chemical oxygen demand.
16BEEE112 ENGINEERING WORKSHOP PRACTICES LABORATORY L T P C 0 0 4 2

Course Objectives

- 1. To prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- 2. to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice
- 3. To prepare for understanding operations of CNC machines
- 4. To prepare for assembling different components in engineering division
- 5. To prepare for carpenter working tools handling
- 6. To prepare students for handling the tools in engineering and furnace division

Course Outcomes

At the end of this course, students will be able to

- 1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
- 2. Students will be able to fabricate components with their own hands.
- 3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- 4. By assembling different components, they will be able to produce small devices of their interest.
- 5. Acquire knowledge of various different tools handling in engineering division
- 6. Knowledge gathering in casting and welding process too

PART – A (MECHANICAL)

i. WELDING

i. Preparation of arc welding of butt joints, lap joints and tee joints.

ii. BASIC MACHINING

- i. Simple Turning and Taper turning
- ii. Drilling and Tapping
- iii. Sheet Metal Work
- iv. Model making Trays, funnels, etc.

iii. DEMONSTRATION ON

- i. Smithy operations
 - ii. Foundry operations
- iii. Plumbing Works
- iv. Carpentary Works

PART -B (ELECTRICAL & ELECTRONICS)

iv. ELECTRICAL ENGINEERING

- i. Study of electrical symbols and electrical equipments.
- ii. Construct the wiring diagram for Stair case wiring and Fluorescent lamp wiring.
- iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energy meter.
- iv. Measurement of electrical quantities voltage, current, power & power factor in R load.
- v. Measurement of energy using single phase energy meter.

v. ELECTRONICS ENGINEERING

- i. Study of Electronic components- Resistor (color coding), capacitors and inductors.
- ii. Soldering practice Components Devices and Circuits Using general purpose PCB.
- iii. Study of logic gates AND, OR, NOT, NOR and NAND.
- iv. Study of HWR and FWR.

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jeyachandran, K., Natarajan, S. and Balasubramanian, S	A Premier on Engineering Practices Laboratory	Anuradha Publishers, Kumbakonam	2007
2	Jeyapoovan, T., Saravanapandian, M	Engineering Practices Lab Manual	Vikas Puplishing House Pvt. Ltd, Chennai	2006
3	Bawa, H.S	Workshop Practice	Tata McGraw – Hill Publishing Company Limited, New Delhi	2007

16BEEE113COMPUTER PRACTICE AND PROGRAMMING LABORATORY
L T P C 1 0 4 3

Course Objectives

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools using algorithm
- Understand, analyze and implement software development tools using linux
- Acquire and analyze the roots of equations
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

Course Outcomes:

The course will enable the students.

- 1. To formulate simple algorithms for arithmetic and logical problems.
- 2. To translate the algorithms to programs(in C language).
- 3. To test and execute the programs and correct syntax and logical errors.
- 4. To implement conditional branching, iteration and recursion.
- 5. To decompose a problem in to functions and synthesize a complete program using divide and conquer approach. and use arrays, pointers and structures to formulate algorithms and programs.
- 6. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

THEORY:

What is computer- Computer Components- What is C- C Character set- Constants, Variables and Keywords-General form of C Program - Relational and Logical Operators - Selection Structures- If and nested if - Switch Case - Loops-Definition and types- Functions- Arrays- Introduction to Strings-Pointers.

PRACTICALS:

- 1. Working with word Processing, Spreadsheet and presentation software in Linux
- Programming in Scratch: Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops and event driven programming
- 3. C Programming:

Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input and Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Strings and function, implementation of pointers.

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	E. Balagurusamy	Computing Fundamentals and C Programming	TMH Education, 5 th Edition	2014
2	Yashavant Kanetkar	Let us C	BPB Publications, 13 th Edition	2013

16BECC151*

HUMAN VALUES

LTPC 100

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TOTAL: 20 HOURS

Course Objectives

1.To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings

2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence.

3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

4.To know the value of being a human being.

5. To provide a much needed orientational input in value education to the young enquiring minds.

6.To study the value of being a useful citizen.

Course Outcomes

1.To involves a systematic and rational study of the human being vis-à-vis the rest of existence.

2. To make free from any dogma or value prescriptions.

3. To analysis process of self-investigation and self-exploration, and not of giving sermons.

4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.

5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

6. To Educate the values and meaning of life in the young minds and to transform them as responsible citizens

UNIT I

Human life on Earth - Concept of Human Values - Value Education - Aim of education and value

education - Types of values - Components of values - Attitudes - types of attitudes

UNIT II

Self Development : Self analysis – Goal Setting - Thought Analysis – Guarding against Anger - Respect to age, experience, maturity, family members, neighbors, co-workers

UNIT III

Individual Qualities – Truthfulness – Constructivity – Sacrifice – Sincerity - Self Control – Altruism – Tolerance - Scientific Vision – Regulating Desire

UNIT IV

Mind Culture - Modern Challenges of Adolescent - Emotions and behavior - Sex and spirituality - Adolescent Emotions - Meditation

UNIT V

Body and Mind Fitness : (a) Physical Exercises (b) Activities: (i) Moralization of Desires (ii) Neutralization of Anger (iii) Eradication of Worries (iv) Benefits of Blessings .

REFERENCES

S.No	Author(s) Name	Title of the Book	Publisher	Year of
				Publications
1	Subramanian. R	Professional Ethics	Oxford, New Delhi	2013

2	Govindarajan. M, Natarajan.	Engineering Ethics	Prentice Hall	2004
	S, Senthil Kumar. V.S		of India, New	
			Delhi	
3	Tripathi. A.N	Human Values	New Age	2009
			International	
4	Pope. G. U.	Thirukkural with English	Uma	2002
		Translation	Publication,	
			Thanjavur.	

SEMESTER II

16BECC201A

BUSINESS COMMUNICATION

3003

Course Objectives:

- To help students comprehend the role of listening skills in effective communication.
- To familiarize students with verbal and non-verbal communication.
- To expose students to neutral accent.
- To develop emotional intelligence skills in them for enhancing their self-esteem.
- To assist them in setting goals and developing positive attitude.
- To enable students to acquire decision making skills, problem solving

Course Outcomes:

- Design and deliver a persuasive presentation that convinces the audience of the topic's relevance and overcomes resistance, using appropriate visual support and adhering to a specified time limit.
- Use a strategic communication model and critical thinking to identify objectives, analyze audiences, and choose the most effective structure and style for delivering strategically sound written and spoken messages.
- Practice principles of effective business writing and document design in all written documents.
- Build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
- Develop their soft skills and inter personal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- Acquire decision making skills, problem solving skills and assertive skills.

UNIT I

What is Business Communication? - Types of Communication – Formal and informal communication – Process of Communication- modes of Communication – Barriers to communication.

UNIT II

Written Business Communication – Style- word-usage- organisation of Ideas – mechanics of writing and fill up of forms - Cover Letter- Letter for Job Application- Letter of Complaint - Memos - Resumes
Email- Reports Revising and proofreading- Advertising slogans- jargons- Description of Graphics and visual aids - interpretation of graphs using expressions of comparison and contrast.

UNIT III

Reading and Understanding the news articles - Oral Business Communication - First Impressions -Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage

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fright- Visual aids Presentations- Capturing Audience - Tone - Behavior - Telephone Etiquette-Non - verbal communication - Eye contact - Facial expressions - Posture - Gestures - Body langage – Etiquette- Organization of presentation – brain storming- Negotiations.

UNIT - IV

Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.

UNIT - V

Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building -Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing -Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

TOTAL: 45 HOURS

TEXT BOOK:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Meenakshi Raman ; Prakash Singh	Business Communication	Oxford University Press	2012

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REFERENCES:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Murthy, G .R. K.	Soft Skills for Success.	The ICFAI University Press, Hyderabad.	2008
2	Jagadeesan, G & Santanakrishnan,R.	Soft Skills Development: Training and Evaluation.	The ICFAI University Press, Hyderabad.	2008
3	Sherfield, Robert M., Rhonda J. Montgomery, & Patricia G. Moody	Developing Soft Skills.	Pearson Education, New Delhi.	2005

WEBSITES

- 1. http://tribehr.com/social-hr-software/talent-management/skills-tracking
- 2. www.ispeakyouspeak.blogspot.com
- 3. https://alison.com/subjects/6/Personal-Development-Soft-Skills
- 4. www.learning-development.hr.toolbox.com
- 5. http://www.niit.com/solution/soft-skill-training
- 6. http://mybcommlab.com to test your understanding of the concepts presented in each chapter and explore additional materials that will bring the ideas to life in videos, activities, and an online multimedia e-book.

Course Objectives:

- To motivate learners to acquire listening & speaking skills in both formal and informal context
- To focus on question forms & to make them understand the important of using question tags and also the functional use of transformation of sentences.
- To improve their reading habit and to train them in critical and analytical reading
- To equip them to write for academic as well as work place context
- To enable students to face interviews
- To study the receptive and productive skills

Course Outcomes:

Students undergoing this course will be able to

- Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- Enhance them reading texts critically and analytically
- Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Enrich the ability to face interviews with confidence.
- Enable to write documents and formal written communication
- Admire and appreciate elegancy in communication.

UNIT-1

Listening - Difference between Hearing & Listening –Listening to informal conversation. **Speaking** - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., **Reading** – Extensive and Intensive reading. **Writing** – Report writing - Writing a covering letter. **Grammar** – Regular & Irregular verbs - Kinds of sentences - Question tags. **Vocabulary** – Homonyms and Homophones.

UNIT-II

Listening – Note Taking- Improving grasping ability. Speaking – Welcome address - Vote of thanks - Master of ceremony. Reading – Active and Passive reading - Reading for vocabulary- Reading for a purpose. Writing - Writing a review (Film review) - Summary of a story. Grammar - Modal verbs – Conjunction - Expression of cause and effect. Vocabulary - Phrasal verbs - Idioms.

$\mathbf{UNIT} - \mathbf{III}$

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Listening - Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid reading – Skimming, Scanning and Surveying. (SQ3R)**Writing** - Essay writing -Minutes of meeting - Agenda – **Grammar** - Active and Passive voice - Purpose expression. **Vocabulary** - Same words used as noun and verb - Often misspelt and confused words.

UNIT-IV

Listening – Listening to telephone conversation - Viewing model interviews. **Speaking** – Group Discussion - Correlation between verbal & non - verbal communication. **Reading** – Reading comprehension (short & long text) - Reading job advertisements and profile of a company. **Writing** – Job application - Resume writing - Checklist preparation. **Grammar** - Numerical expressions – Collocations - **Vocabulary** - Singular and Plural (Nouns)

UNIT- V

Listening – Types of listening- Improving listening comprehension. **Speaking** - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., **Reading** -Note making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation writing – Short essays writing- **Grammar**- Transformation of sentences (Simple, Compound & Complex). **Vocabulary** - Collection of Technical Vocabularies with their meanings.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

TOTAL: 45 HOURS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	<u>Sangeeta</u> <u>Sharma</u> , <u>Meenakshi</u> <u>Raman</u>	<u>Technical Communication:</u> <u>Principles And Practice</u> 2 nd Edition	OUP, New Delhi.	2015

TEXT BOOK:

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REFERENCES:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2008
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES :

- 1. <u>www.learnerstv.com</u> Listening/ Speaking/ Presentation
- 2. <u>www.usingenglish.com</u> Writing/ Grammar
- 3. <u>www.englishclub.com</u> Vocabulary Enrichment/ Speaking
- 4. <u>www.ispeakyouspeak.blogspot.com</u> Vocabulary Enrichment/ Speaking
- 5. <u>www.teachertube.com</u> Writing Technically
- 6. <u>www.Dictionary.com</u> Semantic / Grammar

Course Objectives:

- To have knowledge in integral calculus and Vector calculus
- To expose the concept of Analytical function and Complex integration.
- The syllabus is designed to develop the use of integrals techniques which is needed by Engineers for practical applications.
- It aims to equip the students in integration to solve engineering problems
- To learn Basic concepts of multiple and vector integrals.
- To study complex integration

Course Outcomes:

The student will be able to

- Solve problems in Fluid Dynamics, Theory of Elasticity, heat and mass transfer etc.
- Find the areas and volumes using multiple integrals
- Improve their ability in Vector calculus
- Expose to the concept of Analytical function.
- Apply Complex integration in their Engineering problems
- Analysis the real time application of it.

UNIT-I MULTIPLE INTEGRALS

Double integral – Cartesian coordinates – Polar coordinates – Change of order of integration – Triple integration in Cartesian co-ordinates – Area as double integrals.

UNIT-II VECTOR CALCULUS

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorems (Statement Only)- Surfaces : hemisphere and rectangular parallelopipeds.

UNIT- III PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT-IV ANALYTIC FUNCTIONS

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z and bilinear transformation.

UNIT-V COMPLEX INTEGRATION

Complex Integration - Cauchy's integral theorem and integral formula (Statement Only) – Taylor series and Laurent series - Residues – Cauchy's residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi circle (excluding poles on the real axis).

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TEXT BOOKS:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATIO
				Ν
1	Hemamalini. P.T	Engineering	McGraw-Hill	2014
		Mathematics I & II	Education Pvt.Ltd,	
			New Delhi	
2	Grewal, B.S.	Higher Engineering	Khanna Publishers,	2014
		Mathematics	Delhi.	

REFERENCES:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Erwin Kreyszig	Advanced	John Wiley & Sons.	2011
		Engineering	Singapore	
		Mathematics.		
2	Venkataraman, M. K.	Engineering	The National	2005
		Mathematics.	Publishing Company,	
			Chennai	
3	Narayanan. S,	Advanced	Viswanathan	2002
	Manicavachagam	Mathematics for	S.(Printers and	
	pillay.T.K and	Engineering Students.	Publishers) Pvt. Ltd.	
	Ramaniah.G		Chennai.	
4	Michael D.	Advanced	Pearson Education,	2009
	Greenberg	Engineering	India	
		Mathematics		

WEBSITES:

- 1.www.efunda.com
- 2. www.mathcentre.ac.uk
- 3. www.sosmath.com/diffeq/laplace/basic/basic.html
- 4. www.mathworld.wolframe.com

16BEPH203

ENGINEERING PHYSICS L T P C 3003

Course Objectives:

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
- Understand the basics of laser and optical fiber with appropriate applications.
- Introduce the concepts of quantum mechanics for diverse applications.
- Impart the basic knowledge of crystal and its various crystal structures.
- Disseminate the fundamentals of nuclear physics and their applications
- To inculcate the characteristics of electronic materials through basics.

Course Outcomes

- Identify the elastic nature of materials and its thermodynamic properties.
- Infer the characteristics of laser and optical fibers for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Identify the different atomic arrangements of crystals and its defects
- Make use of the concepts of sound waves for medical applications
- Illustrate the basic ideas of nuclear reactors for energy resources

UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS

Three types of modulus of elasticity – basic definitions, relation connecting the moduli (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bending Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER -CO₂, Semiconductor LASER- Applications of LASER in industry and medicine.Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNIT III QUANTUM PHYSICS

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave

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function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electron microscope.

UNIT IV CRYSTAL PHYSICS

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEAR PHYSICS

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition –Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

TOTAL: 45 HOURS

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641	2015

REFERENCES:

S.NO	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
	NAME	BOOK		PUBLICATION
1	Serway and Jewett	Physics for Scientists and Engineers with Modern Physics	Thomson Brooks/Cole, Indian reprint, New Delhi	2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	Dhanpat Rai Publications,New Delhi.	2011
3	M.N. Avadhanulu and PG Kshirsagar	A Text book of Engineering Physics	S.Chand and company, Ltd., New Delhi	2011
4	D.C. Ghosh, N.C. Ghosh, P.K. Haldar	Engineering Physics	University Science, New Delhi	2011

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5	P. Khare, A.	Engineering Physics:	Jones & Bartlett	2009
	Swarup	Fundamentals and	Learning	
		Modern Applications		

WEBSITES:

- www.nptel.ac.in
 www.physicsclassroom.com
 www.oyc.yale.edu
 www.physics.org

TPC

3003

- To gain knowledge on adsorption phenomena.
 Course Objectives:
 To make the students conversant with basics of water technology.
- To make the student acquire sound knowledge of electrochemistry and storage devices.
- To acquaint the student with concepts of fuels and rocket propellants.
- To develop an understanding of the basic concepts of corrosion science.
- To acquaint the students with the basics of surface chemistry.

Course Outcomes

Upon completion of the course the students will be able to

- Outline the basic principles of chemistry for water treatment (K) ٠
- Examine the electrochemical properties to design non conventional energy storage devices (S)
- Apply the concepts combustion of different fuels (S)
- Identify the concepts of corrosion and its protection in the engineering field (S)
- Apply the concepts of surface chemistry in the field of engineering

UNIT I WATER TECHNOLOGY

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation, UV treatment) – Boiler feed water - Requirements - Disadvantages of using hard water in boilers - Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) - External conditioning – Demineralization process – Desalination

Reverse osmosis.

UNIT II ELECTROCHEMISTRY AND STORAGE DEVICES

Electrochemical cells - EMF - Measurement of emf - Single electrode potential -Nernst equation - Reference electrodes -Standard Hydrogen electrode -Calomel electrode - Ion selective electrode - Glass electrode and measurement of pH -Electrochemical series – Significance – Potentiometric titrations (Redox - Fe²⁺vs dichromate) -Electrolytic conductance-application (conductometric titration)-Batteries-Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H₂-O₂ Fuel Cell.

UNIT III FUELS AND COMBUSTION

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and

Fischer-Tropsch method - Knocking

- Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel- Introduction-GCV-NCV-Flue gas analysis.

UNIT IV CORROSION SCIENCE

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings - Organic coatings-Paints -Constituents and functions –Inorganic coatings- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hot dipping.

UNIT V SURFACE CHEMISTRY AND PHASE RULE

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening).Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

TOTAL: 45 HOURS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

TEXT BOOKS:

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3 rd Reprint NewDelhi.	2013

2.	Kuriakose. J.C.	Chemistry in Engineering and	Tata McGraw Hill Publishing	2010
	and Rajaram	Technology. Vol. I & II	Company, New Delhi.	
		5 th edition.		
3.	Jain, P.C. and	Engineering Chemistry.	Dhanpat Rai	2009
	Monika Jain		Publishing Company (P) Ltd., New Delhi.	
4.	Dara.S.S	Text book of Engineering Chemistry.	S.Chand & Co.Ltd., New Delhi	2008
5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001

WEBSITES:

- 1. http://www.studynotes.ie/leaving-cert/chemistry/
- 2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html
- 3. http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
- 4. http://ocw.mit.edu/courses/#chemistry
- 5. http://www.chem.qmul.ac.uk/surfaces/sec

Course Objectives

- To give a comprehensive insight into natural resources, ecosystem and biodiversity.
- To educate the ways and means of the environment
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures
- To impart knowledge on ecosystem and biodiversity.
- To motivate public to participate in environment protection and improvement.

Course Outcomes (COs) Upon completion of the course the students will be able to

- Recognize the importance of natural resources (S)
- Associate themselves with the various ecosystems (S)
- Describe the importance of biodiversity (S)
- Identify and minimize the difference pollutions (S)
- Prioritize and analyses the social issues (S)

• Integrate the environmental principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

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Definition, Scope and Importance – Need for public awareness -Forest resources: Use and over- exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources- role of an individual in conservation of natural resources.

UNIT II ECOSYSTEM

Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere- Concept of an ecosystem- Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem)

UNIT III BIODIVERSITY

Introduction to biodiversity, Definition- Genetic diversity, Species diversity and Ecosystem diversity, Bio-geographical classification of India, Importance of biodiversity-Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered

and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation of biodiversity.

UNIT IV ENVIRONMENTAL POLLUTION

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes– Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone and landslides.

UNIT V SOCIAL ISSUES AND ENVIRONMENT

From Unsustainable to Sustainable development, Urban problems related to energysources,Water conservation, Rain water harvesting and Watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics-Issues and possible solutions- Climate change- Green house effect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act-Human Rights- Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Population explosion.

TOTAL: 45 HOURS

S.No	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1.	Dr. Ravikrishnan,	Environmental	Sri Krishna Hi tech Publishing	2012
	А	Science	Company Private Ltd.,	
			Chennai	
2.	Anubha kaushik	Environmental	New Age International (P)	2010
	C.P. Kaushik	Science and	Ltd., New Delhi.	
		Engineering		

TEXT BOOKS

REFERENCES

S.No	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1.	William	Principles of	Tata Mc Graw -Hill Publishing	2008
	P.Cunningham	Environmental	Company, New Delhi.	
		Science		
2.	Linda D. Williams	Environmental	Tata Mc Graw -Hill Publishing	2005
		Science Demystified	Company Ltd., New Delhi.	
3.	Bharucha Erach	Environmental	Mapin Publishing (P) Ltd.,	2005
		Science Demystified	Ahmedabad.	
4.	Tyler Miller G. Jr	Environmental	Thomson & Thomson	2004
		Science	Publishers, New Delhi.	

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5.	Trivedi, R.K. and	Introduction	to	Air	Techno-Science	Publications,	2003
	Goel, P.K	Pollution			Jaipur.		

WEBSITES

- 1. http://people.eku.edu/ritchisong/envscinotes1.html
- 2. http://nptel.ac.in/courses.php?disciplineId=120
- 3. www.newagepublishers.com/samplechapter/001281.
- 4. www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm
- 5. http://www.sciencedaily.com/news/top/environment/

Course Objectives

- To gain knowledge on the principles and procedure for the Analysis of Circuits.
- To enable the students to understand the DC circuit analysis and network theorems.
- To learn the Sinusoidal steady state analysis.
- To Obtain the solution of first and Second order system
- To learn and analyze the electrical circuits using Laplace Transforms.
- To understand transients and resonance in RLC circuits and coupled circuits.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Apply network theorems for the analysis of electrical circuits.
- Obtain the solution of first and Second order system
- Analyze the electrical circuits using Laplace Transforms.
- Obtain the transient and steady-state response of electrical circuits.
- Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
- Analyze two port circuit behavior.

UNIT I BASIC CIRCUITS ANALYSIS

Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC 12

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin's and Norton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V ANALYSING THREE PHASE CIRCUITS

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power factor measurements in three phase circuits.

TOTAL: 60 HOURS

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TEXT BOOKS:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sudakar A. and Shyam Mohan S.Palli	Circuits and Networks (Analysis and Synthesis)	Tata McGraw Hill Book Co	2007
2	A.Chakrabarti	Circuit Theory – Analysis and Synthesis	Dhanpat Rai & Co. New Delhi, Fifth Edition	2006

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Arumugam and Prem Kumar	Electric Circuit Theory	Khanna Publishers, New Delhi	2000
2	Joseph Edminister	Electric Circuits	Schaum's outline series, Tata McGraw Hill Book Company, Third Edition	2013
3	Hayt W.H and Kemmerley J.E	Engineering Circuit Analysis	Tata McGraw Hill Book Co., Fifth Edition	2002

16BEPH211 ENGINEERING PHYSICS LABORATORY L T P C 0042

Course Objective

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and Summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure
- To learn the bandgap of semiconductor

Course Outcome

- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Prepare for the lab experiment and perform individually a wide spectrum of experiments.
- Present experimental data in various appropriate forms like tabulation, and plots.
- Analyze, Interpret and Summarize experimental results.
- Communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- Prepare to develop the skills for understanding basic electric circuits

LIST OF EXPERIMENTS – PHYSICS

- 1. Determination of velocity of sound and compressibility of liquid Ultrasonic interferometer.
- 2. Determination of wavelength of mercury spectrum spectrometer grating.
- 3. Determination of Young's modulus of the material Non uniform bending (or) Uniform bending.
- 4. Determination of Viscosity of liquid Poiseuille's method.
- 5. Spectrometer Dispersive power of a prism.
- 6. Torsional pendulum Determination of Rigidity modulus.
- 7. Particle size determination using Diode Laser
- 8. Determination of Laser parameters Wavelength, and angle of divergence.
- 9. Determination of acceptance angle in an optical fiber.
- 10. Determination of thickness of a thin wire Air wedge method
- 11. Determination of Band Gap of a semiconductor material.
- 12. Determination of Specific resistance of a given coil of wire Wheatstone Bridge

Course Objective

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To estimate the amount of alkalinity ions, hardness, chloride in water sample
- To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
- To acquaint the students with the determination of molecular weight of a polymer by viscometry
- To carried out different types of titrations for estimation of concerned in materials
- To study the molecular weight and degree of polymerization using viscometry.

Course Outcome

- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
- Estimate the amount of alkalinity ions, hardness, chloride in water sample
- Measure molecular/system properties of conductance of solutions, EMF etc
- Acquaint the students with the determination of molecular weight of a polymer by visocometry
- Determine the corrosion rate of steel by weight loss method.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more qualities and quantities of materials involved for accurate results.

LIST OF EXPERIMENTS – CHEMISTRY

- 1. Estimation of alkalinity of Water sample.
- 2. Estimation of hardness of Water by EDTA
- 3. Estimation of chloride in Water sample (Argentometric method)
- 4. Determination of corrosion rate by weight loss method.
- 5. Conductometric Titration (Simple acid base).
- 6. Conductometric Titration (Mixture of weak and strong acids).
- 7. Conduct metric Titration using $BaCl_2$ vs Na_2 SO₄.
- 8. pH Titration (acid & base).
- 9. Potentiometric Titration (Fe^{2+} / KMnO₄ or K₂Cr₂O₇).
- 10. Estimation of Ferric ion by Spectrophotometry.
- 11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
- 12. Determination of molecular weight and degree of polymerization using Viscometry.
- 13. Determination of chemical oxygen demand.

16BEEE212 ELECTRIC CIRCUITS LABORATORY L

Course Objective

- To impart the basic knowledge about the Electric circuits.
- To understand the different electrical measurements.
- To understand the working of oscilloscope.
- To acquire the knowledge of network theorems
- To observe and analyze the electrical parameters in RLC resonance circuits
- To experiment the basic laws in voltage and current

Course Outcomes (Cos)

At the end of this course, students will demonstrate the ability

- To understand and analyze basic electric circuits.
- Getting basic practical knowledge about the DC Electric circuits.
- Getting knowledge about the testing of different network theorems using simple circuits.
- To introduce basic electrical equipments in the lab
- To enable the students to analysis the basic laws using simple circuits.
- Apply the knowledge in real time application.

LIST OF EXPERIMENTS

- 1. Study of Electrical Measurements and the Oscilloscope.
- 2. Study of Potentiometers and Rheostats.
- 3. Study and verify of Series Circuits, Parallel Circuits and Series-Parallel Circuits in DC Circuits.
- 4. Study and verify of Ohm's Law and Kirchoff's law.
- 5. Study and verify of Mesh Analysis.
- 6. Study and verify of Nodal Analysis.
- 7. Verification of Superposition Theorem
- 8. Verification of Thevenin's Theorem
- 9. Verification of Maximum Power Transfer Theorem
- 10. Verification of Series RLC Resonance and Parallel RLC Resonance.

- To prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice
- To prepare the students for creating drawings in engineering
- To prepare the students for getting experience in engineering graphics
- To prepare the students for getting experience in engineering solid modelling and computer aided design
- To prepare the students to get better understandings in projection of solids.

Course Outcomes

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Do orthographic projection of lines and plane surfaces. •
- Draw projections and solids and development of surfaces.
- Prepare isometric and perspective sections of simple solids.
- Demonstrate computer aided drafting. •
- Analysis the real time application of it •

UNIT I **INTRODUCTION**

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning- linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

SCALES AND PLANE CURVES UNIT II

SCALES: Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics - Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNIT III FREE HAND SKETCHING

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views - Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT IV PROJECTION OF POINTS, LINES AND PLANE SURFACES (3 + 12)

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT V **PROJECTION OF SOLIDS**

(3 + 12)

(3+12)

(3 + 10)

(3+10)

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

INTRODUCTION TO DRAFTING SOFTWARE/PACKAGE (NOT FOR EXAM) (4)

Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

TOTAL: 75 HOURS

S.	Author(s)	Title of the Book	Publisher	Year of
No.	Name			Publication
1.	Venugopal K	Engineering Graphics	New Age	2007
	and Prabhu		International	
	Raja V		Publishers	
2.	VTU	A Primer on Computer Aided	Belgaum	2006
		Engineering Drawing		

TEXT BOOKS:

REFERENCES:

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1.	Kumar M S	Engineering Graphics	D D Publications,	2007
			Chennai, Ninth	
			Edition	
2.	Bureau of Indian	Engineering Drawing Practices for	BIS, New Delhi	2003
	Standards	Schools and Colleges SP 46		
3.	Luzadder W J	Fundamentals of Engineering	Prentice Hall Book	1998
		Drawing	Co., New York	

WEBSITES

- 1. IS 10711 2001: Technical products Documentation Size and lay out of drawing sheets.
- 2. IS 9609 (Parts 0 and 1) 2001: Technical products Documentation Lettering.
- 3. IS 10714 (Part 20) 2001 and SP 46 2003: Lines for technical drawings.
- 4. IS 11669 1986 and SP 46 2003: Dimensioning of Technical Drawings.
- 5. IS 15021 (Parts 1 to 4) 2001: Technical drawings Projection Methods.

COURSE OBJECTIVES

- 1. To understand the basic concepts of QUANTITATIVE ABILITY
- 2. To understand the basic concepts of LOGICAL REASONING Skills
- 3. To acquire satisfactory competency in use of VERBAL REASONING
- 4. To solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
- 5. To solve off-campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
- 6. To compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

COURSE OUTCOMES

- 1. Understand the basic concepts of QUANTITATIVE ABILITY
- 2. Understand the basic concepts of LOGICAL REASONING Skills
- 3. Acquire satisfactory competency in use of VERBAL REASONING
- 4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
- 5. Solve off-campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
- 6. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc

UNIT I

Introduction, Speed Math's, Problems on Numbers, Averages, Ratios and Proportions, Problems on Ages

UNIT II

Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest

UNIT III

Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation and Combination

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Agarwal.R.S	Quantitative Aptitude for Competitive Examinations	S.Chand Limited	2011

2	Abhijit Guha	Quantitative Aptitude for Competitive Examinations	Tata McGraw Hill	2011
3	Edgar Thrope	Test Of Reasoning for Competitive Examinations	Tata McGraw Hill, 4th Edition	2012

SEMESTER III

16BEEE301A METHODS OF APPLIED MATHEMATICS L T P C 3 2 0 4

Course Objectives

1.	To hone	the analytic	cal skills ir	the minds	of Engineers.
					- A

- 2. To provide sound foundation in the mathematical fundamentals necessary to formulate, solve and analyze Engineering problems.
- 3. To study the Fourier series
- 4. To study the basic principles of different transforms.
- 5. To study the application of PDE
- 6. To study the difference equations

Course Outcomes:

Upon Completion of this course the students will be able to:

- 1. Explain the fundamental concepts of probability and standard distributions which can describe real life phenomenon.
- 2. Explain the basic concepts of one- and two-dimensional random variables and their applications in engineering.
- 3. Apply the concept of testing of hypothesis for small and large samples in real life problems.
- 4. Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- 5. Discuss the notion of sampling distributions and statistical techniques used in engineering and management problems.
- 6. Discuss about the techniques in quality control that model engineering problems.

UNIT I LAPLACE TRANSFORM

Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Initial and final value theorems. Inverse Laplace transforms – Convolution theorem (statement only) – Solution of Ordinary Differential Equations with constant coefficients using Laplace transforms – Transform of periodic functions.

UNIT II FOURIER SERIES

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT III FOURIER TRANSFORM

Fourier integral theorem (Statement Only) – Fourier transform pair –Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity – Relation between Fourier and Laplace transforms

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded)

UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS 10

Z-transform - Elementary properties - Inverse Z- transform - Convolution theorem -Formation of

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difference equations – Solution of difference equations using Z - transform.

TOTAL : 60 HOURS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2013
2	Erwin Kreyszig	Advanced Engineering Mathematics.	Wiley India (P) Ltd, New Delhi.	2014

REFERENCES

TEXT BOOKS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Venkateswarlu S	Engineering Mathematics, Vol I	Anuratha Agencies and Publishers, Kumbakonam.	2007
2	Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G	Advanced Mathematics for Engineering Students. Volumes II and III,	Viswanathan S Printers and Publishers Pvt. Ltd. Chennai.	2002
3	Bali N P., Manish Goyal	A text book of Engineering Mathematics	Laxmi Publications Pvt. Ltd., New Delhi	2006
4	Ramana B V	Higher Engineering Mathematics	TataMcGrawHillPublishingCo.Ltd.NewDelhi.	2008

WEBSITES

- 1. www.sosmath.com
- 2. http://mathworld.wolfram.com/FourierSeries.html
- 3. www.nptel.ac.in

Course Objectives:

- 1. To develop analytical skills for solving engineering problems
- 2. To make the students to study about linear algebra and some useful special functions.
- 3. To study the linear transformations
- 4. To get knowledge about inner product spaces
- 5. To study the hyperbolic function
- 6. To study the Bessel function

Course Outcomes:

- Be able to acquire basic knowledge on vector spaces and linear transformations.
- Be able to build and solve the special functions.
- Apply the concept of testing of hyperbolic functions for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Discuss the notion of sampling distributions and statistical techniques used in engineering and management problems.
- Discuss about the techniques in quality control that model engineering problems

UNIT I VECTOR SPACES

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II LINEAR TRANSFORMATIONS

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Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT III INNER PRODUCT SPACES

The Dot Product on Rⁿ and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M -Application: Quadratic Forms

UNIT IV HYPERBOLIC FUNCTIONS, BETA AND GAMMA FUNCTIONS 12

Hyperbolic functions: Hyperbolic functions and Inverse Hyperbolic functions – Identities – Real and imaginary parts – solving problems using hyperbolic functions.

Beta And Gamma Functions : Definitions – Properties – Relation between beta and gamma integrals – Evaluation of definite integrals in terms of beta and gamma functions.

UNIT V BESSEL FUNCTIONS

Bessel Functions – Preliminaries – Definitions – Bessel Differential Equation – Differential recurrence relations – the pure recurrence relation – A generating function – Bessel's integral – Index half and odd integer.

TOTAL : 60 HOURS

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Shahnaz Bathul	TextbookofEngineeringMathematics(SpecialFunctionsandComplex Variables)	PHI Publications, New Delhi.	2009

REFERENCES:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Dr. Grewal B.S.	Higher Engineering	Khanna Publishers, New Delhi.	2013
		Mathematics		2012
2	Anton and	Elementary Linear	Wiley India Edition,	2012
	Rorres	Algebra,	New Delhi.	
		Applications		
		version		
3	Jim Defranza,	Introduction to	Tata McGraw-Hill,	2008
	Daniel Gagliardi	Linear Algebra	New Delhi.	
		with Application		

WEBSITES:

- 1. www.sosmath.com
- 2. www.nptel.ac.in
- 3. www.mathworld.wolfram.com
Course Objectives

- To study the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- To stidy the concepts of magnetic fields
- To study the concepts of magnetic circuits.
- To study the working principles of DC machines as Generator types, determination of their noload/load characteristics, starting and methods of speed control of motors.
- To estimate various losses taking place in D.C. Motor
- To study the different testing methods to arrive at their performance.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- 1. Understand the concepts of magnetic fields
- 2. Understand the concepts of magnetic circuits.
- 3. Understand the operation of dc machines.
- 4. Analyze the differences in operation of different dc machine configurations.
- 5. Analyze the single phase transformers circuits.
- 6. Analyze the three phase transformers circuits.

UNIT I DC GENERATORS

Definitions – Basic laws and rules – Construction and operation - types - Emf equation - Commutation – Armature reaction Applications

UNIT II DC MOTORS

Definitions – Basic laws and rules - Operation - types – Back Emf equation - Torque equation - Starters – Speed control - Applications

UNIT III TESTING OF DC MACHINES

Losses and efficiency – Swinburne's, Hopkinson's and load tests – Retardation test – Electric braking.

UNIT IV SINGLE PHASE TRANSFORMER

Principle of operation – Types and construction–EMF equation-. Phasor diagram - Open Circuit and Short circuit test– Equivalent circuit – Load test – Regulation and efficiency -All day efficiency – Sumpner's tes- applications.

UNIT V THREE PHASE TRANSFORMER

Principle of operation – Types and construction -Three phase transformers connections – Scott connection – Parallel operation - Auto transformers- Inrush current phenomenon and its prevention – Off-load and On-load tap changing- applications

TOTAL: 45 HOURS

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TEXT BOOKS:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kothari D.P. and Nagrath I.J	Electric Machines	Tata McGraw Hill, Fourth Edition	2011
2	Fitzgerald A.E., Kingsly C. and Kusko.A	Electric Machinery	Tata McGraw Hill	2007

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sen S.K	Electric Machinery	Khanna Publishers, New Delhi	2008
2	Say M.G	Alternating Current Machines	5th Edition, Pitman Publishing	2007
3	Irving. L. Kosow	Electrical Machines and Transformers	PHI, 2 nd Edition	2007
4	Theraja B.L. and Theraja A.K	A Text Book of Electrical Technology	Vol. II, S.Chand & Co. Ltd., New Delhi	2007
5	Bimbhra P.S	Electrical Machinery	Khanna Publishers, New Delhi	2009

WEBSITE

 $1.\ http://nptel.iitm.ac.in/courses/IIT-MADRAS/Electrical_Machines_I/index.php$

16BEEE303

Course Objectives

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To impart knowledge on the concepts of electrostatics, electrical potential, energy density and their applications.
- To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
- To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations
- To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector.
- To study the different thermodynamic fields

Course Outcomes

At the end of the course, students will demonstrate the ability

- 1.To understand the basic laws of electromagnetism.
- 2. To obtain the electric and magnetic fields for simple configurations under static conditions.
- 3.To understand the concept of Conductors, Dielectrics and Capacitance.
- 4. To analyze time varying electric and magnetic fields.
- 5.To understand Maxwell's equation in different forms and different media.
- 6.To understand the propagation of EM waves.

UNIT I **INTRODUCTION**

Sources and effects of electromagnetic fields - Vector fields - Different co- ordinate systems -Divergence theorem – Stoke's theorem.

UNIT II ELECTROSTATICS

Coulomb's Law - Electric Field Intensity - Field Due to Point, Line, Surface and Volume Charges - Electric Flux Density - Gauss's law and its Application - Electrical Potential -Electrical Field in Free space, conductors - Electric Field due to infinite long Conductors, circular loop – Boundary Conditions, Poisson's and Laplace's equations – Capacitance – Energy Stored in Capacitance – Energy Density.

UNIT III MAGNETOSTATICS

Lorentz law of force, Magnetic Field Intensity- Biot Savarts law - Ampere's Law - Magnetic Field due to Straight Conductors, circular loop, – Magnetic flux density (B) – B in free space, conductor, Magnetic Materials- Magnetization - Magnetic Field in Multiple Boundary Conditions Magnetic Force – Self Inductance and Mutual Inductance – Inductance of Solenoids, Toroids.

ELECTRODYNAMIC FIELDS UNIT IV

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Faraday's laws, Maxwell's Equations (differential and integral forms) – Conduction Current and Displacement Current – Relation between Field Theory and Circuit Theory.

UNIT V ELECTROMAGNETIC WAVES

9

Generation – Electromagnetic Wave Equations –Wave Propagation in Free Space, Dielectrics and conductors – Skin Depth, Pointing Theorem – Plane Wave Reflection and Refraction.

TOTAL: 45 HOUR

T**EXTBOOKS**

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	William H. Hayt	Engineering Electromagnetics	Tata McGraw Hill, New Delhi	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Nagrath, I.J., Kothari D.P	Electric machines	Tata McGraw Hill publishing Co Ltd., New Delhi	2004
2	Kraus and Fleish	Electromagnetics with Applications	5 th edition, McGraw Hill international edition	2010
3	Sadiku	Elements of electromagnetics	6 th edition, oxford university press	2014
4	Joseph Edminister	Schaum's outline of electromagnetic	4 th edition, McGraw Hill	2013

WEBSITES

1. http://en.wikipedia.org/wiki/Electromagnetic_force

2.http://ocw.mit.edu/OcwWeb/Electrical–Engineering–and–Computer Science/6013Electromagnetics–and–ApplicationsFall2002/CourseHome/index.html

16BEEE304 ELECTRONIC DEVICES AND CIRCUITS

Course OBJECTIVES

- Understand electronic systems with a continuously variable signal
- Understand proportional relationship between a signal and a voltage or current that represents the signal.
- To learn function of basic component's use in linear circuits.
- Understand component symbol, working principle, classification and specification.
- To get more understanding about amplifies and oscillators
- To learn different theorems for simplification of basic linear electronics circuits.

Course Outcomes

- To impart knowledge on semiconductor devices,
- Understand the working of amplifiers,
- Understand the working of oscillators,
- Understand the working of pulse circuits.
- Analysis the real time application of semiconductor diode
- Analysis the application of amplifier, transistor and special devices

UNIT I SEMICONDUCTOR DIODE

Theory of p-n junction – p-n junction as diode – p-n diode currents – Volt-amp characteristics –

Diode resistance – Temperature effect of p-n junction – Transition and diffusion capacitance of p-n diode – zener diode -Diode switching times.

UNIT II TRANSISTOR

Junction transistor – Transistor construction CE, CB and CC configurations – Transistor switching times Voltage rating –Junction field effect transistor–pinch off voltage– output and transfer characteristics

UNIT III AMPLIFIER

CE, CC and Common base amplifiers –Differential amplifiers-Push-pull amplifiers - Negative feedback amplifiers - Voltage / current, series/shunt -Single and double tuned amplifier.

UNIT IV MISELLANEOUS DEVICES

Construction and operation: Solar cell, photodiode, photo transistor, opto coupler and laser diode, UJT, thermistors, piezo electric devices, MOSFETS–FET as a variable resistor.

UNIT V OSCILLATORS AND PULSE CIRCUITS

Oscillators – Colpitts, Hartley, Phase shift, Wien bridge and crystal oscillators. RC Diode clampers and clippers, Wave shaping circuits: Multivibrators types – Schmitt triggers – UJT based saw tooth oscillators- varactor diode, tunnel diode -LDR, LEDs, LCDs.

TOTAL: 45 HOURS

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TEXT BOOKS:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jacob Millman & Christos.C.Halkias.	Electronic Devices & Circuits	Prentice Hall of India, New Delhi.	2003
2	Allen Mottershead	Electronic Devices and Circuits – An Introduction	Prentice Hall of India Private Limited, New Delhi.	2003
3	David A. Bell	Electronic Devices and Circuits	Prentice Hall of India, New Delhi.	2003

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Robert. L. Boylestad & Lo Nashelsky	Electronic Devices & Circuit Theory	Pearson Education	2002
2	Jacob Millman & Herbert Taub	Pulse, Digital & Switching Waveforms	Tata McGraw Hill, Edition 2000	2003
3	Donald L.Schilling and Charles Belove	Electronic Circuits	Tata McGraw Hill	2003

- **Course Objectives**
 - To gain the knowledge about environmental aspects of energy utilization.
 - To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
 - To study about solar energy collectors and its storages
 - To study about the inter connected system in wind power
 - To understand the basic principles fuel cell, Geo thermal power plants.
 - To gain the knowledge about hydro energy.

Course Outcomes

At the successful completion of this course, the student is expected to have/be able to:

- List and generally explain the main sources of energy and their primary applications in the US, and the world.
- Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.
- Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.
- List and describe the primary renewable energy resources and technologies.
- Analyze the different energy sources
- Students gathered the real time inter connected system modeling in wind power

UNIT I INTRODUCTION

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNIT II SOLAR ENERGY

Introduction to solar energy: solar radiation, availability, measurement and estimation- Solar thermal conversion devices and storage - solar cells and photovoltaic conversion - PV systems -MPPT. Applications of PV Systems - solar energy collectors and storage.

UNIT III WIND ENERGY

Introduction - Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration - basic-Types of wind machines . Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT IV HYDRO ENERGY

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V OTHER SOURCES

Bio energy and types –Ful cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional resources of energy	Khanna publishers ,Fourth edition	2010
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. & Parulekar	Energy Technology	Khanna publishers, Fourth edition	2005
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis	2006

WEBSITES

www.energycentral.com
www.catelelectricpowerinfo.com

Course Objectives

- To learn the economics connected with power generation.
- To understand the measurements of various parameter in power plant and their control.
- To study about Powerplant instrumentation
- To acquire knowledge of renewable power system
- To study about technologies of distributed system
- To study layout and working of thermal, nuclear and hydropower plants.

Course Outcomes

At the end of the course the student will gain knowledge about

- 1. Economics of power generation, layout and working of thermal, nuclear and hydropower plants.
- 2. Distributed generation, boiler turbine monitoring system.
- 3. Assess the instrumentation available in the plant
- 4. Demonstrate the monitoring control in the plant
- **5.** Analyze the various cost arrivals for various TARIFF consumers
- 6. Analysis the real time application of it.

UNIT I ECONOMICS OF POWER GENERATION

Choice of power plant; Load management; Number and size of generating unit; Cost of electrical energy; All types of tariff – Calculation – Power factor improvement.

UNIT II THERMAL POWER PLANT

Plant layout; Selection of site – Types of thermal power plants; Steam power plant based on fossil fuels; Thermal power plant equipment: Boiler, economizer, super heater, condenser, combustion chamber and gas loops, turbines, auxiliaries; Instrumentation and control; Heat balance.

UNIT III GAS POWER PLANT

Open and close cycles; Regeneration; Inter–cooling and reheating; Steam – gas power plant; Combined cycle power plant; Plant protection; Instrumentation and Control; Plant management; Plant layout; Optimized Generation; Load flow.

UNIT IV HYDRO POWER PLANT

Mass curve and storage capacity; Classification; Components; Turbines – Characteristics and their selection; Governor; Plant layout and design; Auxiliaries; Underground, automatic, remote controlled, and pumped storage plants. Optimized Generation.

UNIT V NUCLEAR AND DIESEL – ELECTRIC POWER PLANTS

Nuclear reactors and fuels; Radioactivity; Mass defect and binding energy; Chain reaction; Materials used in nuclear plants; Types of reactors. Diesel–electric Power Plant: Fields of use; Sub–systems; Starting and stopping; Heat balance; Plant layout and design; Remote operation; Auxiliaries.

TOTAL: 45 HOURS

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TEXT BOOK:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Black and Veatch	Power Plant Engineering	CBS Publishers & Distributors	2005

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gupta, B. R.	Generation of Electrical Energy	S. Chand Publishing, New Delhi 14 th Edition	2012
2	Deshpande, M. V.	Elements of Power Station Design	PHI Learning Pvt. Ltd reprint	2010

WEBSITES

1. www.energycentral.com
2. www.catelelectricpowerinfo.com

Course Objective

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To observe the speed control experiments in DC motor
- To acquire the knowledge of energy consumption measurements in single phase system
- To observe and analyze the electrical parameters in R load
- To experiment the basic laws in voltage and current

Course Outcomes (Cos)

At the end of this course, students will demonstrate the ability

- To understand and analyze basic electric and magnetic circuits.
- Getting basic practical knowledge about the Electric circuits.
- Getting knowledge about the testing of Electrical Machines and Transformers.
- To observe the speed control experiments in DC moto
- To study the working principles of electrical machines and power converters.
- Gathered knowledge of commercial system energy calculations

- 1. Open circuit characteristics and load test on separately excited DC generator.
- 2. Open circuit characteristics and load test on DC compound generator.
- 3. Open circuit characteristics and load test on DC shunt generator.
- 4. Load test on DC shunt motor.
- 5. Load test on DC series motor.
- 6. Load test on DC compound motor.
- 7. Swinburne's test and speed control on DC shunt motor.
- 8. OC and SC tests on single phase transformer.
- 9. Load test on single phase transformer.
- 10. Sumpner's test.

16BEEE312 ELECTRONIC DEVICES AND CIRCUITS LABORATORY L T P C 0 0 3 2

Course Objectives

- To introduce the fundamentals of BJT
- To impact FET input and output characteristics
- To impact JFET input and output characteristics
- To learn knowledge of transistor
- To study about oscillator
- To study the design and implementation of various electronic circuits

Course Outcomes

- To analysis FET input and output characteristics
- To analysis JFET input and output characteristics
- To demonstrate the knowledge of transistor
- To analysis real time application of oscillator
- To design and implementation of various electronic circuits
- To analysis the real time application of it

- 1. Static characteristics of semiconductor diode.
- 2. Characteristics of Zener diode and study of simple voltage regulator circuits.
- 3. Static Characteristics of transistor configuration.
- 4. Static and transfer characteristics of JFET.
- 5. Differential amplifier using FET.
- 6. Static characteristics of UJT.
- 7. Characteristics of Photodiode and Phototransistor.
- 8. Colpitts oscillator.
- 9. RC Phase shift oscillator.
- 10. Frequency response of common emitter amplifier.

16BEEE313 BASIC SIMULATION LABORATORY FOR ELECTRICAL SYSTEMS

Course Objectives

L T P C 0 0 3 2

- To impart knowledge on the MATLAB software
- To study about Simulink creation using MATLAB
- To study Electrical CAD
- To get knowledge about proteus
- To get knowledge about PLC
- To study about PLC language

Course Outcomes (COs)

- To analysis real time project in MATLAB software
- To analysis real time project using MATLAB coding
- To analysis real time project in Electrical CAD
- To analysis real time project in proteus
- To analysis real time project in PLC
- To analysis real time project using PLC language

- 1. Introduction to MATLAB, Starting and Quitting MATLAB, Basic Commands, Working with Matrices.
- 2. MATLAB Expressions, Relational and Logical Operations, Plotting Function Complex and Statistical Functions, Input / Output of Variables Flow Control.
- 3. MATLAB Simulink Basic; Starting Simulink Basic Elements Building a System -Gathering Blocks - Modifying the Blocks - Connecting the Blocks - Running Simulations.
- 4. Introduction to Electrical CAD : Schematic components and Symbol Builder.
- 5. Electrical CAD: Circuit Builder Component tools and Wire/Wire number tools.
- 6. Introduction to Proteus: Create and name a new file, Insert segment(s) into the session, Edit each segment and Segment Parameters.
- 7. Proteus: Test segments in real time, save the finished session and Transfer it to Proteus.
- 8. Proteus: Create a model and test it.
- 9. Introduction to Programmable Logic Controller (PLC): Program Files, Data Files and input/ output table file operation.
- 10. Programmable Logic Controller (PLC): Program Scan, Scan Process, Data flow overview, Scan Patterns and PLC Programming Language.

Course Objectives

- Understanding the basic concepts of solar power plant.
- Learn the working of PV cell
- Learn the different types of modules
- Learn the application of it
- Gain information regarding maintenance of solar power plant.
- Gain information regarding installation of solar power plant.

Course Outcomes

The students will able to

- Acquire knowledge on PV Module and equipment present in solar power plant
- Understand the installation and maintenance procedures of PV plant
- Design and Select batteries and inverters for PV module.
- Sizing and selection of PV panels
- Arriving the models of accessories needed for solar power plant
- Analysis the real time application

UNIT I INTRODUCTION

Introduction about Solar Energy- History of Photovoltaic System- PV module (Solar Cell) – Types of PV Module – Manufacturing of PV Module – Testing of PV Module – Working Principle of PV Cell – Overview of Solar Power Plant – working Principle of Solar Power Plant – Grid Tie System – Stand Alone System – India 2030 – Selection of PV Module – Inverter – Selection of Inverter – Battery – Selection of Battery – Cable – Selection of Cable – Charger Controller Unit – MPPT – Junction Box.

UNIT II PV SYSTEM

Load List Preparation – Design Sizing & Calculation on PV Panels – Series & Parallel Connection – Site selection – Detailed Introduction on Installation – Installation Techniques – Maintenance of PV Panel & Battery – Importance of Maintenance – Application of photovoltaic system – Advantages & Disadvantages of photovoltaic system.

UNIT III SELECTION & DESIGN

Hands on Practice – Sizing & Calculation on PV Panels to find the number of Panels required for given load - Design & Selection of Battery – Selection of Inverters.

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	I.D. Mayergoyz, W. Lawson	Basic Electric Circuit Theory	Academic Press	1996
2	John Balfour, Michael Shaw	Adavanced Photovoltaic System Design	-	-
3	Ryan Mayfield	Photovoltaic Design and Installation for Dummies	-	-
4	Solar Energy International	Photovoltaic: Design and Insatllation Manual	-	-

SEMESTER IV

16BEEE401

ELECTRICAL MACHINES II

L T P C 3 2 0 4

Course Objectives

- To learn Construction and performance of salient and non-salient type synchronous generators.
- To get the knowledge of operation and performance of synchronous motor.
- To study and understand the concept of AC machine windings.
- To study and understand the concepts of rotating magnetic fields.
- To study the operation and performance of 3 Phase induction motors and its starting and speed control.
- To study the Construction, principle of operation and performance of single phase induction motors and few special machines

Course Outcomes

At the end of this course, students will demonstrate the ability to

- 1. Understand the concept of AC machine windings.
- 2. Understand the concepts of rotating magnetic fields.
- 3. Understand the operation of ac machines.
- 4. Analyze performance characteristics Induction Machines.

5. To understand the different types of single phase induction motor based on its starting methods.

6. Understand the operation of synchronous motor and analyze the performance of motor under different loading and excitation conditions.

UNIT I ALTERNATORS

Alternators - Types and constructional features - Emf equation-parallel operation - Armature reaction - Load characteristics – Phasor diagram - Predetermination of regulation by EMF, MMF and ZPF methods.

UNIT II TWO REACTION THEORY

Basic ideas of two reaction theory - Direct and quadrature axis reactances and their determination - Phasor diagram and regulation of salient pole alternators - Parallel operation - Synchronizing torque - Expression for synchronizing power.

UNIT III SYNCHRONOUS MOTORS

Synchronous motors - Principle of operation - Synchronous machines on infinite bus bars - Phasor diagram - V and inverted V curves - Current and power circle diagrams - Hunting and its suppression - Starting methods – Synchronous condenser.

UNIT IV INDUCTION MOTORS

Polyphase induction motors - Types and constructional features - Principle of operation - Torque - slip characteristics -Effect of rotor resistance - Equivalent circuit - Circle diagram - Starting and speed control of Induction motor-Introduction to Induction generator.

UNIT V SINGLE PHASE INDUCTION MOTOR

Construction and Principle of operation of single phase induction motor- Double revolving field theory –Methods of starting – types- Applications.

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TEXT BOOK:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kothari D. P. and Nagrath I. J	Electric Machines	Tata McGraw Hill, Fourth Edition	2011
2.	Theraja B. L and Theraja A. K	A Textbook of Electrical Technology	Vol. II, S Chand & Co. Ltd., New Delhi	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Fitzgerald A. E., Kingsly C. and Kusko A	Electric Machinery	Tata McGraw Hill	2007
2	Langsdorf A. S	Theory of A.C Machinery	Tata McGraw Hill	2001
3	Sen. S. K	Electric Machinery	Khanna Publishers, New Delhi,	2008
5	Bimbhra P.S	Electrical Machinery	Khanna Publishers, New Delhi	2009

WEBSITES

- 1. www.classle.net/sites/default/files/text/68781/2_2_0.pdf
- 2. www.gtbit.org/downloads/emecsem3/emecsem3n4qbank.pdf

16BEEE402 TRANSMISSION AND DISTRIBUTION SYSTEMS L T P C 3 0 0 3

Course Objectives

- To develop expression for computation of fundamental parameters of lines.
- To categorize the lines into different classes and develop equivalent circuits for these classes.
- To study the voltage distribution in insulator strings and cables and methods to improve the same
- To learn the modeling of transmission line parameters.
- To study the different insulation materials
- To learn about the use of cables in transmission line parameters

Course Outcomes

At the end of the course the students will be able

- To understand the transmission and distribution systems of electric power,
- To understand electrical and mechanical design parameters of lines.
- To understand the transmission line parameters
- To analyze and modeling the transmission line parameters
- To understand the different cables for transmission lines
- To understand the different insulation materials for transmission lines

UNIT I INTRODUCTION

Structure of electric power system: Generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability, application of HVDC transmission system.

UNIT II TRANSMISSION LINE PARAMETERS

Parameters of single and three phase transmission lines with single and double circuits: Resistance, inductance and capacitance of solid, stranded and bundled conductors: Symmetrical and unsymmetrical spacing and transposition; skin and proximity effects; interference with neighbouring communication circuits. Typical configuration, conductor types and electrical parameters of 400, 220, 110, 66 and 33 kV lines.

UNIT III MODELING AND PERFORMANCE OF TRANSMISSION LINES 12

Classification of lines: Short, medium and long line; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, loadability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss. Sag computations. FACTS (qualitative treatment only): SVC, TCSC, STATCOM and UPFC.

UNIT IV INSULATORS AND CABLES

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Insulators: Types, voltage distribution in insulator string and grading, improvement of string efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, dielectric stress and grading, thermal characteristics.

UNIT V SUBSTATION, GROUNDING SYSTEM AND DISTRIBUTION SYSTEM 12

Types of substations: bus-bar arrangements; substation bus schemes: single bus scheme, double bus with double breaker, double bus with single breaker, main and transfer bus, ring bus, breakerand-a-half with two main buses, double bus-bar with bypass isolators. Resistance of grounding systems: Resistance of driven rods, resistance of grounding point electrode, grounding grids, design principles of substation grounding system; neutral grounding. Radial and ring-main distributors, interconnectors. AC distribution: AC distributor with concentrated load; three-phase four wire distribution system sub-mains; stepped and tapered mains.

TOTAL: 60 HOURS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Hadi Saadat	Power System Analysis	Tata McGraw Hill Publishing, New Delhi Company	2003
2	Central Electricity	Guidelines for Transmission	Tamil Nadu	2003
	Authority (CEA)	System Planning	Electricity Board	
3	Colin Bayliss and	Transmission and	Elsevier, Newnes	2007
	Brian Hardy	Distribution Electrical		
		Engineering		

TEXT BOOKS

REFERENCES

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Gupta, B. R	System Analysis and Design	S.Chand, New Delhi	2003
2	V.K.Metha	Principles of power system	S.Chand & co, New	2010
	Rohit Metha		Delhi	
2	Singh, S. N	Electric Power Generation,	Prentice Hall of India	2002
	_	Transmission and	Pvt. Ltd, New Delhi	
		Distribution		

WEBSITE

1. http://www.adamiano.com/

16BEEE403A MEASUREMENTS AND INSTRUMENTATION LTPC3003

- To study the units, dimensions and standards.
- To study the different types of measuring instruments.
- To provide adequate knowledge in electrical and electronic measurement techniques and instruments.
- To make the students to have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working.
- Introduction to general instrument system, error, calibration etc.
- Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power, etc.

Course Outcomes

At the end of the course the students will have

- Learn units, dimensions and standards.
- Learn basics of different types of measuring instruments to measure different electrical quantites •
- Apply their knowledge to measure electrical quantities using standard analog and digital measuring • instruments
- Basic knowledge of measurement systems towards measurements, including error analysis, . interpretation, experimental uncertainty, calibration, etc.
- To apply basic concepts of measurement systems with electrical signals, including signal conditioners (gain, attenuation), indicating and recording devices
- Measure different electrical parameters usin conventional bridges and acquire data through digital measuring instruments and interpret the data.

INTRODUCTION UNIT I

Functional elements of an instrument - Units and standards of measurements - Static and dynamic characteristics - Sources of Errors in measurement - DC and AC bridges -Wheatstone, Kelvin's double, Maxwell, Anderson, Wien and Schering bridges-Measurement of high resistance -Standards and calibration.

UNIT II MEASURING INSTRUMENTS

Classification of instruments - working principle of potentiometers - Principle of operation and construction of PMMC, MI, type instruments – Principle types and working of analog and digital voltmeters, ammeters and multimeters - Determination of B-H curve and measurement of iron loss - Instrument transformers - CT and PT - Instruments for measurement of frequency and phase.

UNIT III MEASUREMENT OF POWER AND ENERGY

Dynamometer type wattmeter - Single and three phase wattmeters - Induction type instruments -Single and three phase energy meters – calibration of energy meters – direct and phantom loading - Grounding techniques - Megger - Power factor meter- Principle of operation, construction and types of digital frequency meters, Digital Energymeters.

UNIT IV STORAGE, DISPLAY DEVICES AND TRANSDUCERS

Magnetic measurements - Magnetic disk and tape-recorders - Strip chart recorder - XYrecorder. Digital plotters and printers - Cathode ray Oscilloscope- digital CRO and dot matrix display. Classification of transducers - Selection of transducers - Resistive - capacitive and inductive

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transducers – LVDT – Piezo-electric, optical and digital transducers.

UNIT V VIRTUAL INSTRUMENTATION

Concept of VIs and sub VI - Display types – Digital – Analog – Chart and Graphs. Loops - structures - Arrays – Clusters. Local and global variables – String and file I/O. Timers and dialog control.

TOTAL: 45 HOURS

TEXT BOOKS

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S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Doebelin. E.O.	Measurement Systems – Application and Design	Tata McGraw Hill Publishing Company, New Delhi.	2003
2	Sawhney. A. K.	A Course in Electrical and Electronic Measurements and Instrumentation	Dhanpat Rai and Co., New Delhi.	2004

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1.00	- (0			
1	Moorthy. D.	Transducers and	Prentice Hall of India	2003
	V. S.	Instrumentation	Pvt. Ltd, New Delhi.	
2	Martin	Electrical Measurements	NewAge	2001
	Reissland		International	
			(P) Ltd., Delhi.	
3	Gupta, J. B	A Course in Electronic and	S. K. Kataria and Sons,	2003
		Electrical Measurements	Delhi.	
4	Gary. W.	LabVIEW Graphical	Tata McGraw Hill	2006
	Johnson and	Programming	Publications,	
	Richard		New York.	

WEBSITES

1. http://www.elect.mrt.ac.in

16BEEE403B TRANSDUCER ENGINEERING

Course Objectives

- To impart knowledge about the principles and analysis of sensors.
- Discussion of errors and error analysis.
- Emphasis on characteristics and response of transducers.
- To have an adequate knowledge in resistance transducers.
- Basic knowledge in inductance and capacitance transducers and exposure to other transducers
- To get the knowledge of recent development in it

Course Outcomes

At the end of the course the student will be able to

- 1. Understand all types of sensors and transducers.
- 2. Justify the concept and working principle of different transducers and sensors
- 3 Justify the transducers that will be utilised in the electrical industries
- 4. Identify recent developments in transducer domain
- 5. Discover the knowledge for small technology up gradations in it
- 6. Analysis the real time application.

UNIT I SCIENCE OF MEASUREMENTS AND INSTRUMENTATION OF TRANSDUCERS

Units and standards – Calibration methods – Static calibration – Classification of errors – Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS

Static characteristics – Accuracy, precision, resolution, sensitivity, linearity etc. Dynamic characteristics – Mathematical model of transducer – Zero, I and II order transducers. Response to impulse, step, ramp and sinusoidal inputs.

UNIT III VARIABLE RESISTANCE TRANSDUCERS

Principle of operation, construction details, characteristics and application of resistance potentiometer, strain gauge, resistance thermometer, thermistor, hot-wire anemometer, piezo resistive sensor and humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 9

Induction potentiometer – Variable reluctance transducers – EI pick up – LVDT – Capacitive transducer and types – Capacitor microphone – Frequency response.

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UNIT V OTHER TRANSDUCERS

Piezoelectric transducer, magnetostrictive – IC sensor – Digital transducers – Smart sensor – Fibre optic transducer.

TOTAL:45 HOURS

TEXT BOOKS:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	E.A. Doebelin	Measurement Systems – Applications and Design	Tata McGraw Hill, New York	1990
2	A.K. Sawhney	A course in Electrical & Electronic Measurement and Instrumentation	Dhanpat Rai and Co (P) Ltd	2004

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	D. Patranabis	Sensors and Transducers	Prentice Hall of India	1999
2	John P. Bentley	Principles of Measurement Systems	Pearson Education	2000
3	Hermann K.P. Neubert	Instrument Transducers	Oxford University Press	2000
4	D.V.S Murthy	Transducers and Instrumentation	Prentice Hall of India	2001
5	S. Ranganathan	Transducer Engineering	Allied Publishers Pvt. Ltd	2003
6	Al Sutko and J.D. Faulk	Industrial Instrumentation	Vikas Publications Delhi	1996

16BEEE404PULSE AND DIGITAL LOGIC CIRCUITS

Course Objectives

- To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
- To study the applications of Op–amp.
- To introduce the fundamentals of Digital Circuits, combinational and sequential circuits.
- To study various number systems and to simplify the mathematical expressions using Boolean functions simple problems.
- To study the implementation of combinational circuits
- To study the design of various synchronous and asynchronous circuits

Course Outcomes

At the end of the course the students will be able to understand the characteristics ,applications of operational amplifier and importance of analysis and design of digital circuits.

1. Obtain discrete representation of LTI systems.

2. Analyze stability of open loop and closed loop discrete-time systems.

3.Design and analyze digital controllers.

- 4.Design state feedback and output feedback controllers.
- 5. Analysis the real time application of digital controllers.
- 6. Analysis the real time application of State space approach

UNIT I INTRODUCTION AND CHARACTERISTICS OF OPAMP

Ideal OP-AMP characteristics-Non ideal characteristics- DC characteristics- Input bias current-Input bias voltage-Input offset current-Thermal drift.AC characteristics –Frequency response-Frequency compensation techniques- Slew rate. Basic applications of op-amp – summer, differentiator and integrator.

UNIT II APPLICATIONS OF OPAMP

Instrumentation amplifier, first and second order active filters, V/I and I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

UNIT III NUMBER SYSTEM AND BOOLEAN ALGEBRA

Review of number system; types and conversion, codes. Boolean algebra: De–Morgan's theorem, switching functions and simplification using K–maps and Quine McCluskey method.

UNIT IV COMBINATIONAL CIRCUITS

Design of Logic gates. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates and multiplexers.

UNIT V SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

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Flip flops – SR, D, JK and T. Design of synchronous sequential circuits – Counters, state diagram; state reduction and state assignment. Analysis of asynchronous sequential machines, state assignment and asynchronous design problem – Hazards.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Roy Choudhary, D,	Linear Integrated Circuits	New Age Publishing,	2003
	and Sheil B Jani		New Delhi.	
2	Morris Mano M	Digital Logic and	Prentice Hall of India,	2002
2		Computer Design	New Delhi.	2002
		Fundamentals Logic	Jaico Publishing, New	
3	Charles H Roth	Design	Delhi.	2002

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jacob Millman,	Integrated Electronics -	Tata McGraw Hill,	2003
	Christos C Halkias	Analog and Digital	New Delhi.	
		circuits system		
			Deensen Edeest's n	
2	Flovd. L.	Digital Fundamentals	Pearson Education,	2003
		8	New Delhi.	
2	John F Wakarly	Digital Design Principles	Pearson Education,	2002
3		and Practice	New Delhi.	

BASIC THERMODYNAMICS AND ENERGY CONVERSION DEVICES 16BEEE405A LTPC 3003

Course Objectives

- Basic concepts and first law of thermodynamics ٠
- Second law of thermodynamics ٠
- Gas power cycles
- Refrigeration and Air conditioning systems.
- Different modes of Heat Transfer
- Different modes of energy conservation

Course Outcomes

At the end of the course the student will be able to understand the following

- Basic laws of thermal engineering
- Concepts of Entropy and heat engines of the closed system
- To gain experience in gas cycles and its performance
- Need of R&AC in various climatic conditions and its factors
- To gain knowledge of all heat transfer systems
- To understand the application of it.

UNIT I - BASIC CONCEPTS OF THERMODYNAMICS

System - Ideal gas laws - Perfect gas, thermodynamic equilibrium, property, state, process, path and cycle, zeroth law of thermodynamics - Point and path functions - Quasi static process, reversible and irreversible processes. First law of thermodynamics, energy, work, heat, PMM1, applications of First law to closed and open systems. Pressure - Volume diagrams, steady flow process, application of steady flow energy equation.

UNIT II - SECOND LAW OF THERMODYNAMICS

Limitations of first law, statements of second law of Thermodynamics, PMM II, Clausius inequality, heat engine, heat pump, refrigerator, Carnot cycle, Carnot theorem, entropy, temperature - Entropy diagram, entropy changes for a closed system. Third law of thermodynamics.

UNIT III - GAS POWER CYCLES

Otto, Diesel, dual cycles: Efficiency, mean effective pressure, comparison. Introduction to Brayton cycle - Reheat and regeneration.

UNIT IV - REFRIGERATION AND AIR-CONDITIONING

Vapour compression refrigeration: Working principle, simple problems in vapour compression refrigeration cycle with sub-cooling and superheating. Introduction to vapour absorption system.

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Air-conditioning - Factors affecting air-conditioning, types of air-conditioning - Summer, winter, window and central air-conditioning.

UNIT V - HEAT TRANSFER

Modes of heat transfer, steady state heat conduction - Plane wall, composite wall, hollow and composite cylinders. Overall heat transfer coefficient. Convection, empirical relations. Laws of radiations - Concept of block body - Radiant heat transfer between two surfaces. TOTAL 60 hours

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rajput.R.K	Thermal Engineering	Lakshmi Publications	2010
2	Yunus A.Cengel	Introduction to Thermodynamics & Heat Transfer	McGraw Hill Higher- Education	2009

REFERENCES

S No	Author(s) Name	Title of the Book	Publisher	Year of
D. 110.	Author (5) Manie	The of the book	i ublisher	Publication
1	Kothandaraman.C.P,	A Course in Thermal	Dhanpat Rai & Co. (P)	2010
	Domkundwar.S,	Engineering	Ltd.	
	Anand Domkundwar			
2	ΝασΡΚ	Engineering	Tata McGraw Hill,	2008
2	Nag.I .IX	Thermodynamics	New Delhi	2000
			3rd Edition, Tata	
3	Sarkar.B.K	Thermal Engineering	McGraw Hill, New	-
			Delhi	

COURSE OBJECTIVE

Students will learn

- various types of materials
- Ferrous metals and their properties
- Non ferrous metals and their properties
- Ceramic materials and their properties
- Polymers and composites
- the applications of it in engineering and technology

COURSE OUTCOMES

- At the end of the course the student will be able to understand the concepts of engineering materials
- To acquire the difference need of ferrous and non ferrous materials in various applications
- To understand the properties of ceramic and glasses in real time need
- Future requirement of microstructural activities and its need in real time world
- Valued the mechanical behaviour of various composites
- Observe the temperature deviation in various metals

UNIT I INTRODUCTION TO ENGINEERING MATERIALS

Atomic bonding and Crystal structure of engineering materials. Chemical and Physical properties of engineering materials. Mechanical Properties and Behaviours of Materials – Stress - Strain Relationships, Tensile Strength, Hardness, Impact Strength, Fatigue & Stress Rupture, Creep & Stress Rupture, Comparison of Material Properties

UNIT II FERROUS METALS AND THEIR PROPERTIES

Iron - Carbon Equilibrium Diagram, Carbon Steel & AISI Numerical Identification Systems. Properties, processing and applications of Alloy Steel, Tool Steel, Stainless Steel. General characteristics of metal alloys, Fundamentals of heat treatment and the use of TTT diagrams. Production, forming, and joining of metals.

UNIT III NONFERROUS METALS

Properties, processing and applications of Aluminum, Magnesium & Titanium, Copper and its Alloys, Low Melting Temperature Alloys. Production, forming, and joining of metals. The Chemistry and prevention of corrosion

UNIT IV CERAMIC MATERIALS

Microstructural features of ceramics and glasses - Mechanical properties of ceramics and glasses - Production, forming, and joining of ceramics

UNIT V POLYMERS AND COMPOSITES

Microstructural features of polymers and composites - Mechanical behaviour of polymers and

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composites - Production, forming, and joining of polymers and composites.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ganesan.S and Baskar.T	Engineering Physics II	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William D Callister Jr	Material Science and Engineering-An Introduction	John Wiley ans Sons Inc., , New York,	2013
2	James F Shackelford	Introduction to materials Science for Engineers	Macmillan Publication Company, New York	2014
3	Charles Kittel	Introduction to Solid State Physics	John Wiley & sons, Singapore.	2005

WEBSITES

- 1. www.nptel.ac.in
- 2. www.physicsclassroom.com
- 3. www.oyc.yale.edu
- 4. www.physics.org

16BEEE411 ELECTRICAL MACHINES LABORATORY –II L T P C 0 0 3 2

Course Objectives

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skills
- To study the operation of synchronous motor on infinite bus for different excitation condition
- To Study the performance of single phase induction motor by conducting direct and indirect testing
- To study the performance of three phase induction motor by conducting direct and indirect testing
- To study the importance of various components in alternators
- To study the importance need of ZPF methods

Course Outcomes

- 1. Compare the different indirect testing methods to predetermine the voltage regul salient and non-salient pole alternator
- 2. Determine the positive, negative and zero sequence impedance of alternators
- 3. Analyze the operation of synchronous motor on infinite bus for different excitation
- 4. Assess the performance of three phase induction motor by conducting direct and
- 5. Assess the performance of single phase induction motor by conducting direct an
- 6. Choose the appropriate induction motor starter for various industrial and comme

- 1. Regulation of Alternator by EMF and MMF Methods
- 2. Load test on three phase Alternator
- 3. Regulation of salient pole Alternator by Slip Test
- 4. Regulation of Alternator by ZPF method
- 5.Parallel operation of alternator with bus bar
- 6. V and Inverted V curves of Synchronous Motor
- 7. Equivalent Circuit of three phase Induction Motor
- 8. Load Test on three phase Induction Motor
- 9. Performance characteristics of three phase Induction Motor by Circle Diagram
- 10. Load Test on single phase Induction Motor
- 11. Speed control of Induction Motor
- 12. Study of different types of starting of Induction Motors

16BEEE412

Course Objectives:

- To introduce the scientific computing, covering some important aspects of solving algebraic equations, IVP, BVP.
- To implement the methods using the spread sheet in Excel
- To implement solution of numerical integration
- To implement solution of initial value problems governed by ODE
- To implement solution of BVP governed by PDE
- To implement solution of transcendental equation.

Course Outcomes:

- To develop analytical skills for solving different engineering problems.
- To understand the concepts of Matrices, sequences and series.
- To solve problems by applying Differential Calculus and Differential equations.
- To analysis initial value problems governed by ODE
- To analysis BVP governed by PDE
- To analysis transcendental equation.

LIST OF EXPERIMENTS

- 1. Finding solution of Transcendental equation
 - i) Newton Raphson Method
 - ii) Bisection method
 - iii) Iterative method by reducing the equation to the form x = f(x)
- 2. Finding the dominant eigenvalue and eigenvector by power method
- 3. Numerical integration
 - i) Gauss 2 point and 3 point formulae
 - ii) Trapezoidal method
 - iii) Simpson's 1/3 rule
- 4. Solution of initial value problems governed by ODE
 - i) Runge Kutta 4th order method
 - ii) Modified Euler's method
 - iii) Milne's method
 - iv) Adam Bashforth method
- 5. Solution of BVP governed by PDE
 - i) Laplace Equation
 - ii) One dimensional heat equation
 - a) Explicit method : Bender Schmidt's method
 - b) Implicit method : Crank Nicolson's method
 - iii) One dimensional wave equation

Implicit method

REFERENCES

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Steven C. Chapra, Raymond P. Canale	Numerical Methods for Engineers	McGraw - Hill Pub. Co. Ltd	2014
2	Curtis F. Gerald and Patrick O. Wheatley	Applied Numerical Analysis	Pearson Education, South Asia	2009

16BEEE413 MEASUREMENTS AND INSTRUMENTATION LABORATORY

Course Objectives

- •To deal with measurement of inductance and capacitance.
- •To deal with measurement of resistance.
- •To deal with calibration of current transformer
- •To deal with calibration of single phase energy meter.
- •To get the knowledge of two watt meter method to measure 3 phase power and power factor
- •To deal with calibration of voltmeter, ammeter and wattmeter.

Course Outcomes

- Learn units, dimensions and standards.
- Learn basics of different types of measuring instruments to measure different electrical quantities
- Apply their knowledge to measure electrical quantities using standard analog and digital measuring instruments
- basic knowledge of measurement systems towards measurements, including error analysis, interpretation, experimental uncertainty, calibration, etc.
- To apply basic concepts of measurement systems with electrical signals, including signal conditioners (gain, attenuation), indicating and recording devices
- Measure different electrical parameters using conventional bridges and acquire data through digital measuring instruments and interpret the data.

- 1. Calibration of Pressure and Displacement Transducer.
- 2. Measurement of inductance & capacitance.
- 3. Measurement of resistance using wheatstone bridge
- 4. Calibration of current transformer and Study of instrument transformers.
- 5. Calibration of single phase energy meter.
- 6. Conversion of Galvanometer into Voltmeter and Ammeter.
- 7. Measurement of three phase power and power factor using two wattmeter method.
- 8. Measurements of resistance using Kelvin's bridge.
- 9. Calibration of Voltmeter, Ammeter and Wattmeter
- 10.Study of phantom loading.
- 11.Study of Smart Energy Meter.

Course Objectives

- Understanding the basic knowledge of electricity standards.
- Gain information regarding various electricity equipment standards.
- Learn the battery norms and standards
- Learn the harmonic norms and standards

Course Outcomes

The Students will able to

- Acquire knowledge on various Indian and International standards.
- Understand the standards used for transformer and their sizing.
- Understand the information regarding various electricity equipment standards.
- Understand the battery norms and standards
- Understand the harmonic norms and standards
- Analysis the real time implementation

UNIT I INDIAN AND INTERNATIONAL STANDARDS

Indian Standards – IS – International Standards – ANSI – IEEE – IEC – Transformers – IEC 60076 & IS 2026, Rotating Machines – IEC 60034 & IS 34.

UNIT II STANDARDS FOR SIZING

Battery – IEEE 1115 – Instrument Transformers – IEC 60044 & IS 2705 – Short Circuit study – IEC 60909 & IEC 61363 – Harmonic Study – IEEE 519.

REFERNCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Robert J. Alonzo	Electrical Codes, Standards, Recommended Practice and Regulations : An Examination of Relevant Safety Considerations	P.E. ISBN: 978-0- 8155-2045-0	-
2	Donald Fink, H. Wayne Beaty	Standard Handbook for Electrical Engineers	15 th Edition, ISBN: 0071441468	2006

SEMESTER V

POWER ELECTRONICS

16BEEE501 Course Objectives

•	To introduce the application of electronic devices for
	conversion, control and conditioning of electric power.

- To get an overview of different types of power semi-conductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers and basic topologies of DC–DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods.
- To know the practical application for power electronics converters in conditioning the power supply.
- To get the knowledge of real time application of it

Course Outcomes

At the end of this course students will demonstrate the ability to

1.Understand the differences between signal level.

2. Understand the differences between power level devices.

3. Analyze controlled rectifier circuits.

4. Analyze the operation of DC-DC choppers.

5. Analyze the operation of voltage source inverters.

6.Understand different modulation techniques.

UNIT I POWER SEMI CONDUCTOR DEVICES

Silicon Controlled Rectifier(SCR), TRIAC, DIAC - Structure, V-I Characteristics- Two Transistor

Model, Structure and characteristics of Power Diode, Power BJT, MOSFET, IGBT, GTO, Comparisons of Power Semiconductor Devices-Firing circuits.

UNIT II PHASE CONTROLLED CONVERTERS

Operation and Analysis of Single Phase Half and Fully Controlled Converter using R, RL load-

Three Phase Half and Fully Controlled Converter using R, RL load-Effects of Source Impedance, Dual converter (only Block diagram approach).

UNIT III CHOPPERS

Step-Down and Step-up Choppers-Control Strategies of Chopper- Multi Quadrant Operation of

Chopper- Switched Mode Regulators: Buck, boost, Buck–Boost Regulator- Applications of DC Chopper.

UNIT IV DC-AC CONVERTER

Single phase half bridge and full bridge inverters - three phase bridge inverters (120 and 180 degree modes of operation)- Multilevel inverter (block diagram Approach only)- PWM techniques- single PWM, multiple PWM, Sinusoidal PWM, Current source inverter(CSI).

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UNIT V **AC-AC CONVERTER AND APPLICATIONS**

Single phase cyclo converter, Single phase AC voltage controller- Applications-Uninterrupted Power Supply topologies (On line and Off line) – Flexible AC Transmission Systems – Unified Power Flow Controller– HVDC Transmission.

TEXT BOOKS

TOTAL: 45 HOURS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Muhammad H Rashid	Power Electronics: Circuits, Devices and Applications	Pearson Education New Delhi	2004
2	Ned Mohan, Tore M Undeland, William P Robbins	Power Electronics: Converters, Applications and Design	John Wiley and sons, New Delhi	2003
3	Singh. M.D and Kanchandani	Power Electronics	Tata McGraw Hill &Hill Publication Company limited, NewDelhi	2002

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Bimal K Bose	Modern Power	Pearson Education,	2003
		Electronics and AC	New Delhi	
		Drives		
2	Andrzej M.	Introduction to Modern	Wiley India Pvt. Ltd	2012
	Trzynadlowski	power		
3	Robert W Erickson	Fundamentals of Power	Springer, New Delhi	2006
	and Dragan	Electronics		
	Maksimovic			

WEBSITE

http://nptel.iitm.ac.in/courses/Webcoursecontents/IITKharagpur/PowerElectronics/PDF/L-• 1(SSG)(PE)((EE)NPTEL).pdf
16BEEE502

Course Objectives

- To become familiar with different aspects of modeling of components and system
- To study different methods of analysis of power system for power system planning and operation.
- To model steady-state operation of large sized power system
- To understand the power flow problem using efficient numerical methods suitable for computer application.
- To model and analyses power systems under abnormal (fault) conditions.
- To model and analyses the dynamics of power system for small signal and large signal disturbances and to design the system for enhancing stability.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- 1.Use numerical methods to analyze a power system in steady state.
- 2. Understand stability constraints in a synchronous grid.
- 3. Understand methods to control the voltage, frequency.
- 4. Understand methods to control the power flow.
- 5. Understand the monitoring and control of a power system.
- 6. Understand the basics of power system economics

UNIT I THE POWER SYSTEM – AN OVERVIEW AND MODELING 12

Modern Power System - Basic Components of a power system - Per Phase Analysis Generator model - Transformer model - line model. The per unit system - Change of base.

UNIT II POWER FLOW ANALYSIS

Introduction - Bus Classification - Bus admittance matrix, Nodal method, Singular transformation method without mutual coupling - Solution of non-linear Algebraic equations - Gauss Seidal method - Newton Raphson method - Fast decoupled method - Flow charts and comparison of the three methods.

UNIT III FAULT ANALYSIS - BALANCED FAULT

Introduction – Balanced three phase fault – short circuit capacity – systematic fault analysis using bus impedance matrix – algorithm for formation of the bus impedance matrix.

UNIT IV FAULT ANALYSIS – SYMMETRICAL COMPONENTS AND 12 UNBALANCED FAULT

Introduction – Fundamentals of symmetrical components – sequence impedances – sequence networks – single line to ground fault – line fault - Double line to ground fault – Unbalanced fault analysis using bus impedance matrix.

UNIT V POWER SYSTEM STABILITY

Basic concepts and definitions – Rotor angle stability – Voltage stability – Mid Term and Long

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Term stability – Classification of stability – An elementary view of transient stability – Equal area criterion – Reponses to a short circuit fault- factors influencing transient stability – Numerical integration methods – Euler's method – modified Euler's method – Runge Kutta methods.

TOTAL: 60 HOURS

TEXT BOOKS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Hadi Saadat	Power System Analysis	Tata McGraw Hill Publishing Company, New Delhi.	2002
2	Olle I Elgerd	Electric Energy Systems Theory – An Introduction	Tata McGraw Hill, New Delhi.	2003

REFERENCES

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Kundur, P	Power System Stability and Control	Tata McGraw Hill Publications,	2010
2	Nagrath, I. J. and Kothari, D. P	Modern Power System Analysis	Tata McGraw Hill Publications, New Delhi.	2009
3	Duncan Glover, J. and Mulukutla. S Sarma	Power System Analysis and Design	CL-Engineering. Hyderabad, India.	2001

WEBSITE

http://www.powerqualityanddrives.com

Course Objectives

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
- To introduce stability analysis
- To introduce state variable representation of physical systems
- To introduce the design of compensators.

Course Outcomes

- 1. Derive the transfer function of electrical and mechanical systems using various reduction techniques
- 2. Analyze the response of the control system by investigating steady state error and time domain specifications
- 3. Construct the root locus to find the stability of the system and explain the effects of different types of controller
- 4. Construct the frequency response of the system using various plots and correlate the time and frequency domain specifications and effect of compensation
- **5.** Design the different types of compensators using frequency response plots to stabilize the control system
- **6.** Explain the state variable representation of physical systems with the effects of state feedback its assessment for linear-time invariant systems.

UNIT-I CONTROL SYSTEM MODELLING

System concept, differential equations and transfer functions. Modeling of electric systems, translational and rotational mechanical systems, Simple electromechanical systems. Block diagram representation of systems – Block diagram reduction methods – Closed loop transfer function, determination of signal flow graph. Mason's gain formula – Examples.

UNIT-II TIME DOMAIN ANALYSIS

Test signals – time response of first order and second order systems – time domain specifications – types and order of systems – generalized error co-efficient – steady state errors – concepts of stability – Routh-Hurwitz stability – root locus.

UNIT-III FREQUENCY DOMAIN ANALYSIS

Introduction – correlation between time and frequency response – stability analysis using Bode plots, Polar plots, Nichols chart and Nyquist stability criterion – Gain margin – phase margin.

UNIT-IV COMPENSATORS

Realization of basic compensators – cascade compensation in time domain and frequency domain

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and feedback compensation – design of lag, lead, lag-lead compensator using Bode plot. Introduction to P, PI and PID controllers.

UNIT-V CONTROL SYSTEM COMPONENTS AND APPLICATION OF CONTROL SYSTEMS 12

Stepper motors – AC servo motor – DC servo motor – Synchros – sensors and encoders – DC tachogenerator – AC tachogenerator – Hydraulic controller – Pneumatic controller – Typical application of control system in industry.

TOTAL: 60 HOURS

S.NO.	Author(s) Name	Title of the Book	Publisher	Year of publication
1	Ogata.K	Modern Control Engineering	Prentice Hall of India, New Delhi	2003
2	Nagrath & Gopal	Control System Engineering	New Age International Edition, New Delhi.	2002

TEXT BOOKS

REFERENCES

S.NO.	Author(s) Name	Title of the Book	Publisher	Year of publication
1	Benjamin.C.Kuo	Automatic Control Systems	Prentice Hall of India, New Delhi	2002
2	Norman S. Nise	Control System Engineering	Wiley Publication, 6 th edition	2010

Course Objectives

- •To study the characteristics of switching devices and its applications in rectifier inverter, chopper and resonant converter.
- •To study about power electronic circuits
- •To study about industrial control of power electronic circuits
- •To study about the various characteristic of SCR and TRIAC
- •To study about the various characteristic of PWM inverter
- •To study power electronic circuits for different loads

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. The students will be able to demonstrate the all power semiconductor devices.

2. To expose students to operation and characteristics of power semiconductor devices and passive

components, their practical application in power electronics.

- 3. To provide a practical exposure to operating principles, design and synthesis of different power electronic converters.
- 4. To introduce students to industrial control of power electronic circuits as well as safe electrical connection and measurement practices.
- 5. Able to analyze power electronics circuits
- 6. Able to apply power electronic circuits for different loads

LIST OF EXPERIMENTS

- 1. Demonstrate the characteristics of SCR.
- 2. Demonstrate the characteristics of MOSFET.
- 3. Demonstrate the characteristics of IGBT.
- 4. Design and Simulation studies on single half and fully controlled convertor using R, RL load.
- 5. Design and simulation studies on boost convertor using power semiconductor devices..
- 6. Design and Simulation studies on buck convertor using power semiconductor devices..
- 7. Design and Simulation studies on single phase invertors using power semiconductor devices.
- 8. Implementation of single phase half controlled converter using SCR.

- 9. Implementation of single phase fully controlled convertor using SCR
- 10. Implementation of DC-DC Boost convertor using MOSFET.
- 11. Implementation of DC-DC Buck convertor using MOSFET.
- 12. Implementation of three phase induction motor using PWM inverter

16BEEE512 ANALOG AND DIGITAL CIRCUITS LABORATORY L T P C 0 0 3 2

Course Objectives

- To understand Basic Analog Circuits and their applications using Active Devices
- To learn basic function of single stage amplifier, multistage amplifier and power Amplifier and their working principle.
- To understand the Boolean functions, Adder and subtractor circuits.
- To understand Basic Analog Circuits and their applications using Active Devices
- To understand basic construction of feedback circuits and their application in Oscillators
- Understand basic amplifier and oscillator circuits and their application in analog circuits. Course Outcomes (COs)
- 1. Determine the output wave forms of Full Wave Rectifiers with and without filters.
- 2. Draw the equivalent circuit of MOSFET and sketch the V-I characteristics.
- 3. Design the Darlington amplifier and develop the circuit.
- 4. Compare the theoretical and practical frequency response of Wein bridge oscillators.
- 5. Design of astable and Monostable multivibrators for generation of different waveforms
- 6. Design of clipper and clamper.

LIST OF EXPERIMENTS

- 1. Verification of truth table of Logic Gates and Flip Flops.
- 2. Implementation of Boolean Functions, Adder and Subtractor circuits.
- 3. a. Code converters, Excess 3, 2's Complement, Binary to gray code, Parity generator and

parity checker using suitable ICs.

- b. Encoders and Decoders.
- 4. Counters: Design and implementation of 4-bit modulo counters as synchronous and asynchronous types using FF IC's and specific counter IC.
- 5. Shift Registers: Design and implementation of 4–bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.
- 6. Multiplexer and De-multiplexer (4:1, 8:1 and 1:4, 1:8)
- 7. Study of NE/SE 555 timer in astable and Monostable operation.
- 8. Inverting and non-inverting amplifiers, Adder and comparator using Op-Amps.
- 9. Integrator and Differentiator using Op–Amps.
- 10. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated ICs.
- 11. Voltage to frequency characteristics of NE/ SE 566 VCO IC.
- 12. Frequency multiplication using NE/SE 565 PLL IC.

Course Objectives

Students will learn

- To provide a platform for understanding the basic concepts of linear control theory and its application to practical systems
- The transfer function of DC Shunt Motor.
- To find the frequency response of different compensators
- To find the step response of P Controller.
- To find the step response of PI & PID Controller.
- To identify the type of damping from the given Characteristic equation.
- The speed control of Dc motor..

Course Outcomes (COs)

- Determine the transfer function of DC Shunt Motor.
- Ability to find the frequency response of different compensators
- Ability to find the step response of P Controller.
- Ability to find the step response of PI & PID Controller.
- Ability to identify the type of damping from the given Characteristic equation.
- Evaluate the speed control of Dc motor.

LIST OF EXPERIMENTS

- 1. Transfer function of separately Excited DC generator.
- 2. Transfer function of armature controlled DC shunt motor.
- 3. Transfer function of field controlled DC shunt motor.
- 4. Transfer function of AC servomotor.
- 5. Step response of P, PI, and PID controllers.
- 6. Identification of type of damping from the given characteristic equation of second order system.
- 7. Simulation of step response & step response of second order under damped system using 'C' and MATLAB simulink.
- 8. Frequency response of Lead compensator network.
- 9. Frequency response of Lag compensator network.
- 10. DC Motor speed control.

16BEEE552A* CONTROL AND MAINTENANCE OF ELECTRICAL APPLIANCES L T P C 0 0 1 0

Course Objectives

- Make use of various types of control circuit elements like industrial switches, relays, timers, solenoids, contactors and interlocking arrangement.
- Construct various types of automatic starters for electrical motors.
- Construct control circuits for braking, jogging, reversing operations.
- To make use of PLCs for control applications.
- To study PLCs for controlling the motors.
- To study the single phase preventer circuits using PLC

Course Outcomes

The students will be able to

- Analysis the types of automatic starters for electrical motors.
- Analysis control circuits for braking, jogging, reversing operations.
- Analysis PLCs circuit for control applications.
- Program PLCs for controlling the motors.
- Analysis the single phase preventer circuits using PLC
- Analysis various types of control circuit elements like industrial switches, relays, timers, solenoids, contactors and interlocking arrangement.

LIST OF EXPERIMENTS

- 1. Conduct acidity test on transformer oil.
- 2. Wire and test the control circuit for DOL starter and jogging in cage motor.
- 3. Wire and test the control circuit for automatic and semi-automatic star-delta starter.
- 4. Wire and test the control circuit for dynamic braking of cage motor.
- 5. Wire and test the control circuit for Synchronization of Three Phase Alternators by bright lamp method.
- 6. Test the working of single phase preventer.
- 7. Wire and test the DOL starter using PLC.
- 8. Wire and test the Star-Delta starter using PLC.
- 9. Wire and test the control circuit for jogging, forward and reverse operations using PLC.
- 10. Wire and test the single phase preventer using PLC.

16BEEE552B* PROGRAMMABLE LOGIC CONTROLLER (PLC) L T P C 100-

Course Objectives

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To gain the knowledge of storage techniques in PLC
- To acquire the knowledge about how to handle the data and functions
- To study about flow charts of ladder
- To understand the principles of spray process system

Course Outcome

At the end of the course the student will be able

- To understand the registers and functions in PLC and they are able to do the program.
- To acquire the knowledge of storage techniques in PLC
- Students know how to handle the data and functions
- Students known about advanced controller in PLC applications
- Students gather real time industrial application of PLC
- Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION

PLC- Introductions to the purpose, functions - Identification of various components of the PLC - Typical areas of Application- operations of the PLC in industrial applications.

UNIT II PLC LADDER LOGIC PROGRAMMING

Basic ladder logic symbols – Basic Steps in Ladder logic diagram - Ladder logic evaluation - Start/stop logic – Ladder Logic for simple applications.

UNIT III APPLICATIONS

Ladder logic for motor control - Star Delta PLC Ladder Diagram - Ladder Diagram for DOL Motor Starter.

SEMESTER VI

SOLID STATE DRIVES

16BEEE601 Course Objectives

- 1. To study and understand the operation of electric drives controlled from a power electronic converter and to introduce the design concepts of controllers.
- 2. To understand the stable steady-state operation and transient dynamics of a motor-load system.
- 3. To study and analyze the operation of the converter/chopper fed dc drive and to solve simple problems.
- 4. To study and understand the operation of both classical and modern induction motor drives.
- 5. To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.
- 6. To analyze and design the current and speed controllers for a closed loop solid-state d.c motor drives

Course Outcomes

At the end of the course the students will be able to

- 1. Understand the concept of drive characteristics and various converters used for drives.
- 2. Understand the operation of electric drives controlled from a power electronic converter.
- 3. Understand the stable steady–state operation and transient dynamics of a motor–load system.
- 4. Analyze the operation of the converter/chopper fed dc drive and to solve simple problems.
- 5. Understand the operation of both classical and modern induction motor drives.
- 6. Understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.

UNIT I DRIVE CHARACTERISTICS

Concept of Electric Drives –parts of electrical Drives – Dynamics of electric drive – torque equation – Selection of power rating of motor-Four quadrant operation of electric drives– Loads with rotational and translational motion – Steady state stability- components of load torques-Modes of operation and Characteristics.

UNIT II CONVERTER AND CHOPPER FED DC MOTOR DRIVES

Steady state analysis of the single and three phase converter fed separately excited DC motor drive – continuous and discontinuous conduction -Chopper controlled DC drives - Time ratio control and current limit control - Single, two and four quadrant operations.

UNIT III INDUCTION MOTOR DRIVES

Three phase induction motor drives-AC Voltage controlled drives- variable frequency control –V/f control -Slip Power recovery schemes- rotor frequency control -VSI fed induction motor drive and CSI fed induction motor drive- Basic of vector control.

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UNIT IV SYNCHROUNOUS MOTOR DRIVES

V/f control and self control of synchronous motor: Margin angle control and power factor control - permanent magnet synchronous motor –Sinusoidal and Trapezoidal types, closed loop control of synchronous motor, Basics of Traction drives.

UNIT V CONTTROLLER FOR DRIVES

 $Transfer \ function \ for \ DC \ motor \ / \ load \ and \ converter \ - \ closed \ loop \ control \ with \ current \ and \ speed \ feedback \ , \ design \ of \ controllers; \ current \ controller \ and \ speed \ controller-converter \ selection \ and \ Characteristics.$

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Gopal K Dubey	Fundamentals of Electric	Narosa Publishing	2011
		Drive	house, II Edition	
2	B.K Bose	Modern Power	Pearson Education,	2002
		Electronics and AC	3rd Reprint	
		Drives		

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	S.K. Pillai	A First course on Electrical Drives	Wiley Eastern Limited- Reprint of 3 rd edition	2014

WEBSITE

http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-Delhi/Industrial Drives/index.htm

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16BEEE602 POWER SYSTEM OPERATION AND CONTROL L T P C 3 0 0 3

Course Objectives

- To become familiar with different aspects of modeling of components and system
- To study different methods of analysis of power system for power system planning and operation.
- To model steady-state operation of large sized power system
- To understand the power flow problem using efficient numerical methods suitable for computer application.
- To model and analyze power systems under abnormal (fault) conditions.
- To model and analyze the dynamics of power system for small signal and Large signal disturbances and to design the system for enhancing stability.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- 1.Understand the concepts of power systems.
- 2. Understand the various power system components.
- 3. Evaluate fault currents for different types of faults.
- 4. Understand the generation of over-voltages and insulation coordination.
- 5. Understand basic protection schemes.
- 6. Understand concepts of HVDC power transmission and renewable energy generation.

UNIT I INTRODUCTION

System load variation: System load characteristics, load curves - daily, weekly and annual, loadduration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control: Governor Control, LFC, EDC, AVR, system voltage control, security control.

UNIT II REAL POWER - FREQUENCY CONTROL

Fundamentals of speed governing mechanism and modeling: Speed-load characteristics – Load sharing between two synchronous machines in parallel; concept of control area, LFC control of a single-area system: Static and dynamic analysis of uncontrolled and controlled cases, Economic Dispatch Control. Multi-area systems: Two-area system modeling; static analysis, uncontrolled case; tie line with frequency bias control of two-area system derivation.

UNIT III REACTIVE POWER-VOLTAGE CONTROL

Typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; methods of voltage control: Injection of reactive power. Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting, tap setting of OLTC transformer and MVAr injection of switched capacitors to maintain acceptable voltage

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profile and to minimize transmission loss.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost. Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ -iteration method. (No derivation of loss coefficients) Base point and participation factors. Economic dispatch controller added to LFC control.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS

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Energy control centre: Functions – Monitoring, data acquisition and control. System hardware configuration – SCADA and EMS functions: Network topology determination, state estimation

security analysis and control. Various operating states: Normal, alert, emergency, inextremis and restorative. State transition diagram showing various state transitions and control strategies.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Olle I Elgerd	Electric Energy Systems	Tata McGraw Hill	2003
		Theory – An	Publishing Company	
		Introduction	Ltd, New Delhi	
			2 nd Edition,.	
2	Allen J Wood and	Power Generation,	John Wiley and Sons,	2003
	Bruce F Wollenberg	Operation and Control	Inc	

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kothari, D.P. and Nagrath, I.J.,	Modern Power System Analysis	TataMcGrawHillPublishing CompanyLimited,New	2003
2	Grigsby, L.L	The Electric Power Engineering Hand Book	CRC Press and IEEE Press	2001

WEBSITE

http://www.cdeep.iitb.ac.in/nptel/ElectricalEngineering/PowerSystemOperationandControl/Course Objective.html

16BEEE603A MICROPROCESSOR AND MICROCONTROLLER LTPC 3003

Course Objectives

- To study the Architecture of 8085 and 8051.
- To study the addressing modes and instruction set of 8085 and 8051.
- To introduce the need and use of Interrupt structure.
- To develop skill in simple program writing.
- To introduce commonly used peripheral/interfacing ICs and Advanced Processors.
- To study the advanced processors

Course Outcomes

- 1. At the end of this course, students will demonstrate the ability to Explain about the architecture of 8051 microprocessor, pin configuration, interrupts and the timing diagram of 8085
- 2. Develop the assembly language program using mnemonics and corresponding machine code based on architecture of 8051 microprocessor
- 3. Define the 8051 microcontroller with its architecture, pinouts, memory organization, interrupts and compare the programming concepts with 8051
- 4. Illustrate the interfacing of 8085 with various peripheral devices for transmission, reception and control of data
- 5. Make use of the data conversion technique such as ADC and DAC and to interface with 8085 processor and 8051 microcontroller
- 6. Develop the microcontroller assembly language program for various real time applications

UNIT I 8085 PROCESSOR

Architecture – Functional block diagram – Signals – Memory interfacing – I/O ports and data transfer concepts – Timing Diagram – Interrupt structure.

UNIT II INSTRUCTION SETS

Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation and control instructions.

UNIT III PERIPHERAL INTERFACING

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

UNIT IV 8051 MICRO CONTROLLER

Architecture – Functional block diagram – Instruction format and addressing modes – Interrupt structure – Timer –I/O ports – Serial communication.

UNIT V ADVANCED PROCESSORS

Architecture of PIC 16C7X MICROCONTROLLER - memory organization – Addressing modes – Instruction set – Introduction to TMSLF2407 DSP controller and ARM Processors.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gaonkar, R. S.	Microprocessor Architecture, Programming, and Applications with the 8085	Wiley Eastern Ltd., New Delhi.	2002
2	Muhammad Ali Mazidi and Janice Gilli Mazidi	The 8051 Micro Controller and Embedded Systems	Pearson Education , New Delhi.	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Fernando E Valdes–	Microcontrollers:	CRC , Colorado, USA	2009
	Perez and Ramon	Fundamentals and		
	Pallas–Areny	Applications with PIC		
2	William Routt	Microprocessor	Delmar Cengage	2006
		Architecture,	Learning, New York	
		Programming and		
		Systems Featuring the		
		8085		
3	David Calcutt,	8051 Microcontrollers:	Newnes, United States	2004
	Frederick Cowan,	An Applications Based		
	and Hassan	Introduction		
	Parchizadeh			
4	John B. Peatman	Design with PIC	Pearson Education,	2004
		Microcontrollers	Asia	
5	Hamid A. Tolivat.	DSP based	CRC Press, USA	2003
	Steven Campbell	Electromechanical		
		Motion Control		

WEBSITES

- 1. http://ce.kashanu.ac.ir/sabaghian/micro/Micro_Spring2005.htm 2. http://www.berk.tc/micropro/microlinks.htm
- 3. http://www.arm.com/products/processors/instruction-set-architectures/index.php

Course Objectives

- To expose the students to the fundamentals of microcontroller based system design.
- To teach I/O and RTOS role on microcontroller.
- To impart knowledge on PIC Microcontroller based system design. To introduce Microchip PIC 8 bit peripheral system Design
- To give case study experiences for microcontroller based applications
- To study interface systems for 8051

Course Outcomes

- At the end of the course the student will be able to understand the concepts of PIC
- Define the 8051 microcontroller with its architecture, pinouts, memory organization, interrupts and compare the programming concepts with 8051
- Illustrate the interfacing of 8085 with various peripheral devices for transmission, reception and control of data
- Make use of the data conversion technique such as ADC and DAC and to interface with 8085 processor and 8051 microcontroller
- Develop the microcontroller assembly language program for various real time applications

UNIT I 8051 ARCHITECTURE

Architecture – memory organization – addressing modes – instruction set –Timers - Interrupts - I/O ports, Interfacing I/O Devices – Serial Communication.

UNIT II 8051 PROGRAMMING

Assembly language programming – Arithmetic Instructions – Logical Instructions – Single bit Instructions – Timer Counter Programming – Serial Communication Programming Interrupt Programming – RTOS for 8051 – RTOSLite – FullRTOS – Task creation and run – LCD digital clock/thermometer using FullRTOS

UNIT III PIC MICROCONTROLLER

Architecture – memory organization – addressing modes – instruction set – PIC programming in Assembly & C –I/O port, Data Conversion, RAM & ROM Allocation, Timer programming, MP- LAB.

UNIT IV PERIPHERAL OF PIC MICROCONTROLLER

Timers – Interrupts, I/O ports- I2C bus-A/D converter-UART- CCP modules -ADC, DAC and Sensor Interfacing –Flash and EEPROM memories.

UNIT V SYSTEM DESIGN – CASE STUDY

Interfacing LCD Display – Keypad Interfacing - Generation of Gate signals for converters and Inverters - Motor Control – Controlling DC/ AC appliances – Measurement of frequency -Stand alone Data Acquisition System.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Muhammad Ali	The 8051	Prentice Hall,	2005.
	Mazidi, Janice G.	Microcontroller		
	Mazidi and Rolin D.	and Embedded Systems'		
	McKinlay			

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Muhammad Ali	PIC Microcontroller and	Pearson Education	2008
	Mazidi, Rolin D.	Embedded Systems using		
	Mckinlay, Danny	Assembly and C for		
	Causey	PIC18'		
2	John Iovine	PIC Microcontroller	McGraw Hill	2000
		Project Book		
3	Myke Predko	Programming and customizing the 8051 microcontroller	Tata McGraw Hill	2001

16BEEE604

Course Objectives

- To provide sound knowledge about constructional details and design of various electrical machines.
- To study mmf calculation and thermal rating of various types of electrical machines.
- To design armature and field systems for D.C. machines.
- To design core, yoke, windings and cooling systems of transformers.
- To design stator and rotor of induction machines.
- To design stator and rotor of synchronous machines and study their thermal behaviour.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- 1. Understand the construction of electrical machines.
- 2. Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
- 3.Understand the principles of electrical machine design
- 4. Carry out a basic design of an AC and DC machine.
- 5.Use software tools to do design calculations.
- 6. Understand performance characteristics of electrical machines

UNIT I MAGNETIC CIRCUITS AND COOLING OF ELECTRICAL MACHINES 9

Major consideration in electrical machine design –electrical engineering materials –design limitations and specifications- concept of magnetic circuit – mmf calculation for various types of electrical machines – Gap Contraction Factor –Net Length of Iron -real and apparent flux density of rotating machines -direct and indirect cooling methods – cooling of turbo alternators.

UNIT II DC MACHINES

Constructional details – output equation – main dimensions - choice of specific loadings – choice of number of poles – armature design – winding diagrams – design of field poles and field coil – design of commutator and brushes

UNIT III TRANSFORMERS

Constructional details of core and shell type transformers – output rating of single phase and three phase transformers — design of core, yoke and windings of transformers – equivalent circuit parameters from designed data – design of tank and cooling tubes of transformers.

UNIT IV THREE PHASE INDUCTION MOTORS

Constructional details of squirrel cage and slip ring motors – output equation – main dimensions – choice of specific loadings – design of stator – winding diagrams - design of squirrel cage and slip ring rotor - introduction to computer aided design.

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UNIT V SYNCHRONOUS MACHINES

Output equation – choice of specific loadings – main dimensions – short circuit ratio – design of stator and rotor of cylindrical pole and salient pole machines - design of field coil - performance calculation from designed data - introduction to computer aided design.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Sen, S.K	Principles of Electrical Machine Design with	Oxford and IBH Publishing Co Pyt	2006
		Computer Programs	Ltd., New Delhi	

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Agarwal, R.K	Principles of Electrical Machine Design	S.K.Kataria and Sons, Delhi.	2002
2	Mittle, V.N. and Mittle	Design of Electrical Machines	Standard Publications and Distributors, Delhi.	2002
3	Juha Pyrhonen, Tapani Jokinen, and Valeria Hrabovcova	Design of Rotating Electrical Machines	Wiley .	2009
4	Greg Stone, Edward A Boulter, Ian Culbert, and Hussein Dhirani	Electrical Insulation for Rotating Machines: Design, Evaluation, Aging, Testing, and Repair	1 st edition, Wiley- IEEE Press.	2004

WEBSITES

- 1. www.electricmotors.machinedesign.com/guiEdits/.../bdeee2_1.aspx
- 2. www.advancedmotortech.com/images/InductionMachine_Jan2012.pdf

16BEEE611 MICROPROCESSOR AND MICRO CONTROLLER LABORATORY L T P C 0 0 3 2

OBJECTIVES

On completion of the course, students are able to:

- To understand the basic architecture of 8- bit microprocessors.
- Able to write programs on 8085 microprocessor based systems.
- Identify the addressing modes of an instruction.
- Develop programming skills in assembly language
- To understands the basic architecture of microcontroller.

COURSE OUTCOMES (COs)

1. Apply the basic arithmetic and logical operations using 8085 microprocessor with the help of assembly language programming

2. Analyze the performance of different weighted and non weighted codes, its conversions with logic diagram using 8085 microprocessor

3. Illustrate the interfacing of 8085 with various peripheral devices for serial and parallel communication of data

4. Demonstrate the basic instructions with 8051 microcontroller execution including conditional jumps, looping and calling subroutines

5. Make use of the basic conversion techniques of ADC and DAC to interface it with 8085 processor and 8051 microcontroller

6. Develop a model using processor to apply computing platform and software for engineering problems

LIST OF EXPERIMENTS

8-bit Microprocessor

- 1. Simple arithmetic operations
 - Multi precision addition / subtraction / multiplication / division
- 2. Programming with control instructions
 - Increment / Decrement
 - Ascending / Descending order
 - Maximum / Minimum of numbers
 - Rotate instructions.
 - Hex / ASCII / BCD code conversions
- 3. Interface Experiments
 - A/D Interfacing
 - D/A Interfacing
 - Traffic light controller
- 4. Simple Interfacing experiments using 8251, 8279 and 8254
- 5. Programming practice on assembler and simulator tools

8-bit Micro controller

6. Demonstration of basic instructions with 8051 Micro controller execution, including

- Conditional jumps, looping
- Calling subroutines
- Stack parameter testing
- 7. Parallel port programming with 8051 using port 1 facility
 - Stepper motor and D/A converter
- 8. Programming Exercise on
 - RAM direct addressing
 - Bit addressing
- 9. Programming practice using simulation tools and C compiler
 - Initialize timer
 - Enable interrupts
- 10. Study of micro controllers with flash memory.

Additional Experiments Using 8051 Microcontroller:

- 1. A/D Conversion with LCD display.
- 2. Speed control of DC Motor using PWM technique.
- 3. Programming with flash controller (EPROM, EEPROM).
- 4. Interfacing Monitor and Keyboard.
- 5. Seven Segment display interface.
- 6. Interfacing of I/O devices (Relay, LED and Buzzer).
- 7. PLC programming using 8051microcontroller.
- 8. Study of "In Circuit Debugger".

16BEEE612 ELECTRICAL ESTIMATION AND REWINDING LABORATORY L T P C 0 0 1 0

Course Objectives

- To introduce the basic electrical Estimation in the lab.
- To be able to deal with motor rewinding and transformer winding connections.
- To study the electrical design of party hall.
- To study the electrical design of saw mill.
- To study the electrical design of primary health centre.
- To study the electrical design of university building

Course Outcomes

At the end of the course the students will be able

- To do wiring and winding for all electrical equipment"s.
- To analysis the electrical estimation for residential flat
- To analysis the electrical estimation for University building
- To analysis the electrical estimation for Primary health centre
- To analysis the electrical estimation for Party hall
- To analysis the electrical estimation for Saw mill

LIST OF EXPERIMENTS

ELECTRICAL ESTIMATION:

- 1. Residential single bed room Flat.
- 2. Industrial power wiring having 2 or 3 machines and Irrigation Pump motor (5hp) wiring.
- 3. University building having 6 class rooms with Computer centre having 35 computers, a/c unit, UPS, light and fan.
- 4. Primary Health Centre having minimum 6 rooms.
- 5. Lighting scheme of a party hall having minimum 20 twin TL fittings and Street Light service having 12 lamp light fittings
- 6. Erection of one no. 15hp induction motor in Saw mill / Flour mill and 3 phase Service connection to a building having 5 KW load.

REWINDING:

- 7. Design and wind 230/12-0-12 volt, 500mA Transformer and test it.
- 8. Design and wind a No volt coil used in starter.
- 9. Study about the winding connection diagram for Single Phase Induction Motor.

- 10. Study about the winding connection diagram for Three Phase Induction Motor.
- 11. Wind and insert the coils for ceiling fan motor (minimum 2 coils).
- 12. Give end connection for a 3 phase Induction motor winding for a 2 pole/ 4 pole operations and run it. Measure the No load current and speed.

16BEEE651* PCB DESIGN AND SERVICING OF DOMESTIC APPLIANCES

Course Objectives

Students will learn

- Specification and classification of PCBs
- PCB Fabrication
- Different application of PCB
- Service to domestic appliances
- Installation to domestic appliances
- Repair of domestic appliances

Course Outcomes

Students will able to analysis

- Techniques of PCBs
- PCB Fabrication
- Real time application of PCB
- Service to domestic appliances
- Installation to domestic appliances
- Repair of domestic appliances

UNIT I PCB BASIC PRINCIPLE

Specification and classification of PCBs - Techniques of layout design - Artwork generation Methods - General design factor for digital and analog circuits .

UNIT II PCB FABRICATION

Introduction to PCB technology - PCB Fabrication techniques-single, double sided and multilayer - Etching: chemical principles and mechanisms - Post operations- stripping, black oxide coating and solder masking - PCB component assembly processes

UNIT III INSTALL, SERVICE AND REPAIR OF DOMESTIC APPLIANCES

Installation procedure of electric iron, mixer grinder, ceiling and table fan - Working of Ceiling and Table Fan - circuit description, fault finding - removal of faulty component

SEMESTER VII

16BECC701 PROFESSIONAL ETHICS, PRINCIPLE OF MANAGEMENT AND
ENTREPRENEURSHIPL T P C 3 0 0 3

Course Objective

- •To enable the students to create an awareness on Engineering Ethics, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.
- To study ethics in society and realize the responsibilities and rights in the society
- •To study advanced philosophical knowledge of the profession of recreation and leisure
- To study synthesis of trends and issues as related to current professional practice
- •To evaluation of organizational theories and human resource management principles
- To study the ethical practice and ethical management

Course Outcome

At the end of this course, students will be able to

- Apply ethics in society and realize the responsibilities and rights in the society
- •Discuss the ethical issues related to engineering
- •Advanced philosophical knowledge of the profession of recreation and leisure
- •Synthesis of trends and issues as related to current professional practice
- •Evaluation of organizational theories and human resource management principles
- •Ethical practice and ethical management

UNIT I ENGINEERING ETHICS

Senses of 'Engineering Ethics' – variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – Models of Professional Roles – theories about right action – Self–interest – customs and religion – uses of ethical theories.

UNIT II FACTORS OF CHANGES

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNIT III HISTORICAL DEVELOPMENT, PLANNING, ORGANISING

Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – **Course Objectives** – Setting **Course Objectives** – Process of Managing by **Course Objectives** – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informal organization

- Organization Chart -.

UNIT IV DIRECTING AND CONTROLLING

Human Factors – Creativity and Innovation – Harmonizing **Course Objectives** – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment –Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting

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UNIT V ENTREPRENEURSHIP AND MOTIVATION

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, **Course Objectives**.

TOTAL: 45 HOURS

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S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harold Kooritz and Heinz Weihrich	Essentials of Management	Tata McGraw Hill, New Delhi	2010
2	Khanka S.S	Entrepreneurial Development	S.Chand and Co. Ltd., NewDelhi	2006
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, NewYork	2005

TEXT BOOKS

REFERENCES

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Tripathy P.C and Reddy P.N	Principles of Management	Tata McGraw Hill, New Delhi	2008
2	Rabindra N Kanungo	Entrepreneurship and innovation	Sage Publications, New Delhi	1998
3	Charles E Harris, and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2013

WEB REFERENCES

- 1. <u>http://www.managementstudyguide.com/taylor_fayol.htm</u>
- 2. http://tutor2u.net/business/gcse/people_motivation_theories.htm
- 3. <u>http://lfkkb.tripod.com/eng24/gilliganstheory.html</u>
- 4. <u>http://www.developingeyes.com/five-types-of-entrepreneurs/</u>

POWER SYSTEM PROTECTION AND SWITCHGEAR LTPC 3003 **16BEEE702**

Course Objectives

- To expose the students to the various faults in power system •
- To learn the various methods of protection scheme •
- To understand the current interruption in Power System and study the various switchgears.
- Discussion on various earthing practices, usage of symmetrical components to • estimate fault current and fault MVA.
- Study of Relays, protection scheme, and solid state relays. •
- To understand the method of circuit breaking, various arc theories, Arcing
- phenomena capacitive and inductive breaking, Types of circuit breakers.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- 1. Understand the different components of a protection system.
- 2.Evaluate fault current due to different types of fault in a network.
- 3.Understand the protection schemes for different power system components.
- 4. Understand the basic principles of digital protection.
- 5.Understand system protection schemes, and the use of wide-area measurements.

6. Analysis the Real time application of it.

UNIT I **INTRODUCTION**

Principles and need for protective schemes - nature and causes of faults -Power system earthing -Zones of protection and essential qualities of protection – Protection scheme.

UNIT II OPERATING PRINCIPLES AND RELAY CONSTRUCTIONS

Electromagnetic relays – Over current, directional, distance and differential, under frequency Relays, Reverse power relay, Relay Coordination, Microprocessor based Relay – static relays.

UNIT III **APPARATUS PROTECTION**

Apparatus protection: Transformer, generator, motor; protection of bus bars and transmission lines - CTs and PTs and their applications in protection schemes.

UNIT IV THEORY OF CIRCUIT INTERRUPTION

Physics of arc phenomena and arc interruption. Restriking voltage, Recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, and interruption of capacitive current -DC circuit breaking.

CIRCUIT BREAKERS UNIT V

Types of Circuit Breakers – Air blast, Air break, oil, SF₆ and Vacuum circuit breakers – comparative merits of different circuit breakers – Testing of circuit breakers.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Ravindranath, B. and Chander, N	Power System Protection and Switchgear	New Age International (P) Ltd , New Delhi 2 nd Edition	2011
2	Badri Ram and	Power System Protection	Tata McGraw hill,	2011
	Vishwakarma, D.N.	and Switchgear	New Delhi.	

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Wadhwa, C. L.	Electrical Power	New Age International	2000
		Systems	(P) Ltd , New Delhi	
2	Gupta, P.V.,	A Text book on Power	Reprint – 2009 edition,	2009
	Bhatnagar, V.S.,	System Engineering	Dhanpat Rai and Co,	
	Chakrabarti, A		New Delhi.	
3	Paithankar, Y.G.	Fundamentals of Power	Prentice Hall of India	2003
	and Bhide, S.R.	System Protection	Pvt. Ltd., New Delhi.	

WEBSITES

1. www.pdf-search-engine.com/protection-and-switchgear-pdf.html - 69k 2. https://subjects.ee.unsw.edu.au/elec9712/.

Course Objectives

• To acquire software development skills and experience in the usage of standard package necessary for analysis and simulation of power system required for its planning, operation and control.

- The various line parameters.
- The voltage regulation and efficiency of different types of transmissions.
- A network under unsymmetrical fault conditions and interpret the results.
- The bus impedance and admittance matrix.
- A network under symmetrical fault conditions and interpret the results

Course Outcomes

- Apply load flow analysis to an electrical power network and interpret the results using Gauss-Seidel and Newton Raphson Methods.
- Apply load flow analysis to an electrical power network and interpret the results using Fast-Decoupled Methods.
- Explain the transient stability analysis of single and multi machine infinite bus system
- Examine the electromagnetic transients and its impact in power system studies
- Evaluate the frequency dynamics, economic dispatch of single and two area power systems.
- Evaluate the Economic dispatch in power systems

LIST OF EXPERIMENTS

- 1. Computation of Parameters and Modeling of Transmission Lines.
- 2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
- 3. Load Flow Analysis I: Solution of Load Flow and related Problems using

Gauss-Seidel Method

- 4. Load Flow Analysis II: Solution of Load Flow and related Problems using Newton-Raphson and Fast-Decoupled Methods
- 5. Study of symmetrical and unsymmetrical Fault Analysis.
- 6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
- 7. Transient Stability Analysis of Multi-machine Power Systems
- 8. Electromagnetic Transients in Power Systems.

- 9. Load Frequency Dynamics of Single- Area and Two-Area Systems.
- 10. Economic Dispatch in Power Systems without considering transmission losses.
- 11. Economic Dispatch in Power Systems with transmission losses.

Course Objectives

Students will learn

- Component block of ETAP
- To Draw Single Line Diagram of Power System
- Component block of PSCAD
- Case study of it

Course Outcomes

Students will analysis

- Component block of ETAP
- Single Line Diagram of Power System
- Component block of PSCAD
- Case study of it

UNIT I INTRODUCTION – ETAP

Introduction – Study of components block – To draw Single Line Diagram of Power System.

UNIT II APPLICATION

Load flow Analysis of three bus System and Fault Analysis.

UNIT III INTRODUCTION – PSCAD

PSCAD- Introduction, Features- Study of components block- Creating a small simulation case using PSCAD.

SEMESTER VIII 16BECC801A ENERGY MANAGEMENT, UTILIZATION AND ENERGY AUDITING L T P C 3 0 0 3

Course Objectives

- •To gain the knowledge about energy management.
- •To understand the basic concepts in economic analysis in energy management.
- •To understand the basic principles of energy audit.
- •To gain the knowledge about the basic concept of types of Energy Audit
- •To gain and Evaluate the different energy efficient motors
- •Understand the concept of Energy conservation.
- •To study about the behavior changes of PF requirement in motor currents

Course Outcomes

At the end of this course, students will demonstrate the ability to

- understand and analyse the energy data of industries
- carryout energy accounting and balancing
- conduct energy audit and suggest methodologies for energy savings
- understand the principle, design of illumination systems and energy efficiency lamps.
- analysis the methods of industrial heating and welding.
- understand the electric traction systems and their performance

UNIT I ENERGY MANAGEMENT

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS

Economics analysis – Depreciation Methods, time value of money, Calculation of simple payback, net preset value, internal rate of return, present worth method, replacement analysis, life cycle costing analysis.

UNIT III ILLUMINATION, HEATING AND WELDING

Nature of radiation – definition – laws – photometry – lighting calculations – design of illumination systems (for residential, industrial, commercial, health care, street lightings, sports, administrative complexes) - types of lamps - energy efficiency lamps. Methods of heating, requirement of heating material – design of heating element – furnaces – welding generator – welding transformer and its characteristics.

UNIT IV ELECTRIC TRACTION

Introduction – requirements of an ideal traction system – supply systems – mechanics of train movement – traction motors and control – multiple units – braking – current collection systems – recent trends in electric traction.

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UNIT V BASIC PRINCIPLES OF ENERGY AUDIT

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	W.C.Turner Steve Doty	Energy Management Handbook	John Wiley and Sons 7th Edition	2009
2	E. Openshaw Taylor	Utilization of Electrical Energy in SI Units'	Orient Longman Pvt.Ltd	2003
3	B.R. Gupta	Generation of Electrical Energy	Eurasia Publishing House (P) Ltd, New Delhi	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	H. Partab	Art and Science of Utilisation of	Dhanpat Rai and Co,	2004
		Electrical Energy	New Delhi	
2	C.L.	Generation, Distribution and	New Age	2003
	Wadhwa	Utilization of Electrical Energy	International Pvt.Ltd	
3	J.B. Gupta	Utilization of Electric Power	S.K.Kataria and	2002
		and Electric Traction	Sons	

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• To study about the characteristics of smart grid, models and operating principles.

- To study about energy storage and communication systems used in smart grid.
- To study the models and operating principles of smart grid
- To study the different batteries technology
- To get knowledge about communication system in smart grid
- To study about reliability and stability process

Course Outcomes

- At the end of the course the student will be able to
- 1. Gain the knowledge about Distributed Generations.
- 2. Acquire the knowledge about Island mode of operation.
- 3. Understand the basic knowledge about storage devices
- 4. Analysis the different batteries technology.
- 5. Understand the communication system in smart grid
- 6. Analysis the reliability and stability process

UNIT I INTRODUCTION : SMART GRID AND EMERGING TECHNOLOGIES 9

Defining a smart grid – Characteristics of smart grid - Values of a smart grid – The economic Case – The environmental Case – Benefits to utilities – Benefits to consumers – Power system components – Power system protection: Traditional Vs Smart – Case study – Generation fundamentals – Traditional Generations – Distributed Generations – micro grid generation – Generator Protection – Challenges and Opportunities – Cost of smart grid – Government Regulations – Emerging Technologies - FACTS – optimizing integration systems – Multi generation buildings – Case study.

UNIT IISMART GRID: MODELS AND OPERATING PRINCIPLES9

Solar Photovoltaic models and grid Integration – Design of a 2 MVA PV station – DG system as part of utility power system – The smart grid PV - UPS DG system – Split DC Bus UPS – PV DG system – Island mode of operation – Parallel operation of Inverters – Power Quality. Wind turbine model and grid Integration – Micro turbine model & Grid Integration. Electric Vehicle model and Grid Integration.

UNIT III SMART GRID: DISTRIBUTED GENERATION SYSTEMS

Power Converter System – Control System Development – Current limit and Saturation Control, Simulation using simulate and MATLAB. Inverter Parallel operation – Load sharing control Algorithm – Distributed Generation System and Newton Raphson method in power flow – Plant modeling and 3 phase 4 wire DG unit topology – Single distributed generation System –MIMO Linear system Stability robustness – PWM rectifier control – 3 Phase AC – DC – AC topology.

UNIT IV ENERGY STORAGE AND COMMUNICATION

State–of–the art storage devices – Battery types – Ultra capacitors based Energy Storage System – Flywheel – Wide Area Network – Substation Information System – Wireless Networks – Distribution Automation – AMI Networks – Utility monitoring and Control – Inter-system Coordination – Industrial
systems – Consumer Residential Systems – Network Protection – Channel model Fundamental – Low, medium, High voltage, main Topologies – Residential and Business Indoor wiring Topologies – The Power line Channel model – Digital Transmission Techniques - Threats – IEC61850 Considerations.

UNIT V SMART GRID: RELIABILITY, STABILITY AND COMPONENT INTEGRATION 9

Smart Grid Programming – Virtual Power Producer – Intelligent reconfiguration using SCADA – Problems in distributed grids – Solutions. Integration of Mini – Micro generation in distribution Grids – Power supply Quality generic standards – Renewable Energies specific standards – Smart Grid stability analysis schemes – Supply guarantee and Power quality – Integration in power systems – Distributed Generation advantages and needs.

TOTAL: 45 HOURS

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
1	Fox-Penner	Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities	Island Press , Washington DC	2010
2	StanMark Kaplan, Fred Sissine	Smart Grid: Modernizing Electric Power Transmission and Distribution; Energy Independence, Storage and Security; Energy Independence and Security Act and Resiliency	The Capitol.Net, Washington DC	2009
3	Ali Keyhani Moham mad N. Marwali , Min Dai	Integration of Green and Renewable Energy in Electric Power Systems	Wiley, USA	2009
4	Ryszard Michal Strzelecki , Grzeg orz Pawel Benysek	Power Electronics in Smart Electrical Energy Networks	Springer, USA	2008
5	Hendrik C. Ferreira ,Lutz Lampe , John Newbury,Theo G Swart	PowerLineCommunications:TheoryandApplicationsforNarrowband and BroadbandCommunicationsoverPower LinesInterval 100 (2000)Interval 100 (2000)	Wiley, New York	2010

WEBSITES

1. www.wca.org

2. www.sandc.com

LIST OF DEPARTMENT ELECTIVES

ELECTIVE - I (ONLY APPLICABLE FOR FIFTH SEMESTER)

16BEEE5E01

NETWORK ANALYSIS AND SYNTHESIS

LTPC 3003

Course Objectives

- To understand the concept of network analysis. •
- To understand the basic principles of network theorems. •
- To study the electrical circuits using Laplace Transforms
- To study the transient and steady-state response of electrical circuits. •
- To study the sinusoidal steady-state (single-phase and three-phase).
- To get the knowledge of two port circuit behavior. ٠

Course Outcomes

At the end of this course, students will demonstrate the ability to

- 1. Apply network theorems for the analysis of electrical circuits.
- 2. Obtain the solution of first and Second order system
- 3. Analyze the electrical circuits using Laplace Transforms.
- 4. Obtain the transient and steady-state response of electrical circuits.
- 5. Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
- 6. Analyze two port circuit behavior.

UNIT-I **INTRODUCTION**

Circuits elements, Independent and dependent sources, signals and wave forms; periodic and singularity voltages, step, ramp, impulse, Doublet. Development of circuit concept, Conventions for describing networks.

UNIT-II GRAPH THEORY

Graph of a Network, definitions, tree, co tree, link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.

NETWORK THEOREMS (APPLICATIONS TO AC NETWORKS) 9 UNIT-III

Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.

UNIT-IV FILTERS SYNTHESIS

Classification of filters, Ladder network, T section, IT section, terminating half section. Pass bands and stop bands. Design of constant-K, m-derived filters. Composite filters.

UNIT-V NETWORK SYNTHESIS

Positive real function, definition and properties; Properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point admittance functions using Foster and Cauer first and second forms.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	S Chakraborty	Network Analysis &	Tata Mc graw Hill	2009
	Ghosh A	Synthesis	1 st edition	

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.00	- \			
1	M.E. Van	Network Analysis	Phi Learning - 3rd	2014
	Valkenburg		Edition	
2	Gobind	Principles of Active Network	Wiley India Pvt Ltd	2009
	Daryanani	Synthesis & Design		

16BEEE5E02

Course Objectives

- To study the state variable analysis
- To provide adequate knowledge in the phase plane analysis and also describing function analysis.
- To study the analysis discrete time systems using conventional techniques.
- To analyze the stability of the systems using different techniques.
- To study the design of optimal controller.
- To study the types of compensators

Course Outcomes

At the end of the course the student will be able to

- understand the state variable analysis, Z- transform, state equation
- Construct the frequency response of the system using various plots
- Correlate the time and frequency domain specifications and effect of compensation
- Design the different types of compensators using frequency response plots to stabilize the control system
- Explain the state variable representation of physical systems with the effects of state feedback its assessment for linear-time invariant systems.

UNIT 1 STATE VARIABLE ANALYSIS

Concept of state – State Variable and State Model – State models for linear and continuous time systems – Solution of state and output equation – controllability and observability - Pole Placement –State observer Design of Control Systems with observers

UNIT II PHASE PLANE AND DESCRIBING FUNCTION ANALYSIS 9

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearising non-linear systems - Construction of phase portraits – Singular points – Limit cycles Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – Conditions for stability – Stability of oscillations.

UNIT III Z-TRANSFORM AND DIGITAL CONTROL SYSTEM

Z transfer function – Block diagram – Signal flow graph – Discrete root locus – Bode plot.

UNIT 1VSTATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEMState equation – Solutions – Realization – Controllability – Observability – Stability –
Jury's test.

UNIT V OPTIMAL CONTROL

Introduction -Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design.

TOTAL: 45 HOURS

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TEXT BOOKS

S.	Author(s)	Title of the Book	Publisher	Year of
No.	Name			Publication
1	I.J. Nagrath and M. Gopal	Control Systems Engineering	New Age International Publishers	2003
2	Ashish Tewari	Modern control Design with Matlab and Simulink	John Wiley, New Delhi	2002

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	M.Gopal	Modern control system theory	New Age International Publishers	2002
2	Gene F. Franklin, J. David Powell and Abbasemami- Naeini	Feedback Control of Dynamic Systems	Fourth edition, Pearson Education, Low price edition	2002
3	Raymond T. Stefani & Co	Design of feedback Control systems	Oxford University	2002

16BEEE5E03

Course Objectives

- To study the basic concepts of electric hybrid vehicles.
- To study about energy storage system for hybrid vehicle.
- To gain the knowledge about electric propulsion unit.
- To gain the concept of Hybrid Electric Drive-Trains.
- To gain the different Energy Management Strategies.
- To study about the efficiency manipulation in drives

Course Outcomes

- At the end of the course the student will be able to understand the concepts of electric hybrid vehicle.
- Summarize the basic concepts in bioprocess Engineering.
- Explain the concept of Hybrid Electric Vehicles.
- Understand the concept of Hybrid Electric Drive-Trains.
- Identify the different Energy Management Strategies.
- Understand the concept of different Energy Storage devices.
- Analyze the different motor drives used in Hybrid Electric Vehicles.

UNIT I INTRODUCTION

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

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TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design	CRC Press	2003
		Fundamentals		

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	CRC Press	2004
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley	2003

16BEEE5E04

Course Objectives

- To introduce the fundamental techniques of analog, digital and data communication.
- To explain satellite and fibre optic communication and Networking systems.
- To understand basic signals, analog modulation, demodulation and radio • receivers.
- To explain the characteristics and model of transmission medium •
- To study the recent techniques.
- To get the knowledge about the application of it

Course Outcomes

- Ability to understand and analyze analog circuits. ٠
- Gain Knowledge on digital modulation techniques. ٠
- Understand coding techniques ٠
- Analysis the real time application of it. ٠
- Analysis the model of transmission medium ٠
- To able to modulation and demodulation techniques. ٠

UNIT I **MODULATION SYSTEMS**

Time and frequency domain representation of signals, amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver. Frequency division multiplexing. Pulse width modulation.

UNIT II TRANSMISSION MEDIUM

Transmission lines - Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation - Ground wave and space wave propagation, critical frequency, maximum usable frequency, path loss, white Gaussian noise.

UNIT III DIGITAL COMMUNICATION

Pulse code modulation, time division multiplexing, digital T-carrier system. Digital radio system. Digital modulation: Frequency and phase shift keying – Modulator and demodulator, bit error rate calculation.

UNIT IV DATA COMMUNICATION AND NETWORK PROTOCOL

Data Communication codes, error control. Serial and parallel interface, telephone network, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

UNIT V SATELLITE AND OPTICAL FIBRE COMMUNICATION

Orbital satellites, geostationary satellites, look angles, satellite system link models, satellite system link equations. Advantages of optical fibre communication – Light propagation through fibre, fibre loss, light sources and detectors.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Wayne Tomasi	Electronic Communication	Pearson Education New	2002
		Systems	Delhi	
2	Roy Blake	Electronic Communication	Thomson Delmar,	2002
	-	Systems	New Delhi	

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	William Schweber	Electronic Communication Systems	Prentice Hall of India, New Delhi.	2002
2	Kennedy, G.	Electronic Communication Systems	Prentice Hall of India, New Delhi.	2002
3	Miller, M.	Modern Electronic Communication	Prentice Hall of India, New Delhi.	2003
4	John G Proakis and Masoud Salehi	Communication Systems Engineering	Prentice Hall of India, New Delhi.	2001

WEBSITES

www.complextoreal.com/tutorial.htm
www.discogs.com/artist/Nephlim+Modulation+Systems

16BEEE5E05 INTRODUCTION TO NEURAL NETWORKS

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To study about the perception concept in design
- To study about the design using ART phenomena
- To study about the vector quantization
- To have a solid understanding of Basic Neural Network

Course Outcomes

- At the end of the course the student will be able to sove problems using neural
- 1. Understand the basic concepts of neural networks and its applications in various domains
- 2. Gain knowledge about learning process in Neural Networks
- 3. Apply perception concept in design
- 4. Design using ART phenomena
- 5. Gain knowledge on SOM concepts
- 6. Ability to develop the use of Soft Computing to solve real-world problems

UNIT I INTRODUCTION TO NEURAL NETWORKS

Biological Neuron, artificial neuron-comparison, neuron model, architectures-Feedforward and recurrent types. Perceptron -learning rule-graphical, algorithmn, limitations, multilayer network.

UNIT II BACKPROPAGATION NETWORKS

Backpropagation algorithm-derivation of up-dation rules, drawbacks. Variants of Backpropagation algorithm-momentum, variable learning rate-simple problems. Data based modeling using backpropagation algorithm – applications - example.

UNIT III ASSOCIATIVE AND SELF-ORGANIZING NETWORKS

Associative Learning –supervised and unsupervised types- Instar, outstar and Kohonen networks, Bidirectional associative memories, Hopfield Network. Self organizing map algorithm –Simple problems.

UNIT IV SUPERVISED AND UNSUPERVISED LEARNING NETWORKS 9

Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

UNIT V APPLICATIONS

Applications – Electric drives-Speed control of DC Shunt motor- Neural Network Toolbox in Mat lab-Steepest Descent Backpropogation.

TOTAL: 45 HOURS

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TEXTBOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Martin T.Hagan,Howard B. Demuth, Mark Beale	Neural Network Design	Cenage Learning	2008

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	S.N Sivanandam,	Introduction to Neural	TMH	2006
	S.Sumathi,	Networks using MATLAB		
	S.N.Deepa	6.0		
2	Laurene V.	Fundamentals of Neural	Pearson Education	2004
	Fausett	Networks-architecture,		
		algorithm and application		

Course Objectives

- To study the various representations of data, register transfer language for micro operations and organization and design of a digital computer.
- To teach the concept of micro-programmed control unit, the central processing unit, stack and instruction formats.
- To Study the various arithmetic operation's algorithms
- To study the hardware implementations and concept of pipelining and vector processing.
- To illustrate the techniques to communicate with input and output devices.

Course Outcomes

- 1. Understand the concepts of microprocessors, their principles and practices.
- 2. Write efficient programs in assembly language of the 8086 family of microprocessors.
- 3. Organize a modern computer system and be able to relate it to real examples.
- 4. Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.
- 5. Implement embedded applications using ATOM processor.
- 6. Analysis the real time application of it.

UNIT I DATA REPRESENTATION, MICRO-OPERATIONS, ORGANIZATION AND DESIGN 9

Data representation: Data types, complements, fixed-point representation, floating-point representation, other binary codes and error detection codes.Register transfer and micro operations: Register transfer language, bus and memory transfers, arithmetic micro-operations, logic micro-operations, shift micro-operations, arithmetic logic shift unit.Basic computer organization and design: Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, memory reference instructions, input-output and interrupt. Complete computer description, design of basic computer, design of accumulator.

UNIT II CONTROL AND CENTRAL PROCESSING UNIT

Micro programmed control: memory, address sequencing, micro–program example, design of control unit.Central processing unit: General registers and organization, stack and pointer organization, instruction formats, modes, data transfer and manipulation, program control, reduced Instruction set computer.

UNIT III COMPUTER ARITHMETIC, PIPELINE AND VECTOR PROCESSING 9

Computer arithmetic: Addition, subtraction, multiplication and division algorithms, floating-point arithmetic operations, decimal arithmetic unit, decimal arithmetic operations.Pipeline and vector processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, RISC pipeline, vector processing array processors.

UNIT IV INPUT-OUTPUT ORGANIZATION

Input–output organization: Peripheral devices, input–output interface, asynchronous data transfer (UART and USART), modes of transfer, priority interrupt, direct memory access, input–output processor, serial communication.

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UNIT V MEMORY ORGANIZATION

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Morris Mano	Computer System Architecture	Pearson Education, India	2002
2	John L Hennessy and David A Patterson	Computer Architecture, A Quantitative Approach	Morgan Kaufmann, San Francisco, USA	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Vincent P Heuring and Harry F Jordan	Computer Systems Design and Architecture	Pearson Education, Asia	2002
2	Andrew S Tanenbaum	Structured Computer Organization	Pearson Education, New Delhi	2002
3	William Stallings	Computer Organization and Architecture	Pearson Education, New Delhi	2003

WEBSITES

1. arch-www.cs.wisc.edu

2. ece.eng.wayne.edu/~gchen/ece4680/lecture-notes/lecture-notes.html

FUZZY LOGIC AND ITS APPLICATIONS 16BEEE5E07 LTPC 3003

Course Objectives

- To introduce the basic concepts of Fuzzy logic and its applications in various domain •
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models •
- To study about the development of fuzzy controllers
- To Understand the concepts of adaptive fuzzy control
- To study the fuzzy based model system •

Course Outcomes

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Gain knowledge on theory of Reasoning
- Develop fuzzy controllers •
- Understand concepts of adaptive fuzzy control
- Ability to develop how to use Fuzzy computation to solve real- world problems
- Design fuzzy based model for any application

UNIT I **FUZZY SETS AND RELATIONS**

Classical sets, fuzzy sets-operation, properties. Fuzzy relations-Equivalence and tolerance relation, Fuzzification- membership function-types, methods.

UNIT II FUZZY INFERENCE SYSTEM

Building Blocks of a Fuzzy system, fuzzification, fuzzy Rule-based Systems. Composition of rules, types of inference, defuzzification methods.

UNIT III FUZZIFICATION AND FUZZY ARITHMETIC

Lambda-cuts for fuzzy sets-lambda cuts for fuzzy relations- defuzzification methods - Extension principle-functions of fuzzy sets- fuzzy transform-fuzzy numbers-approximate methods of extension-vertex method-DSW algorithm

UNIT IV FUZZY LOGIC AND FUZZY RULE BASED SYSTEMS

Fuzzy logic -approximate reasoning-fuzzy tautologies-contradictions-equivalence-and logical proofs-other forms of implication operation and composition operation-linguistic hedges-rule based systems-fuzzy associative memories- multi objective decision making.

UNIT V APPLICATIONS

Fuzzy Tool box in Mat lab – Case Study – Temperature Control in a Shower-Water level Control in a Tank.

TOTAL 45 HOURS

TEXTBOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Timothy J.Ross	Fuzzy Logic with Engineering Applications	Wiley student edtion,2nd edition	2007

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S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	George j.Klir & Tina A.Folger	Fuzzy sets Uncertainty & Information	PHI	2001

16BEEE5E08

Course Objectives

- To study about the distributed generation system.
- To study about the relaying and protections in the distributed system.
- To get the knowledge of distributed generation, boiler turbine monitoring system.
- To get the knowledge in Planning of distributed system
- To know the control of DG inverter
- To gather knowledge of protection of distributed systems

Course Outcomes

At the end of the course the students will

- Understand the distributed generation system , boiler turbine monitoring system.
- Understand the Planning of distributed system
- Analysis the control of DG inverters
- Analysis the protection of distributed systems
- Understand the rel time system
- Analysis the norms and standards used in it

UNIT I INTRODUCTION TO DISTRIBUTED GENERATION

Introduction to the concept of distributed generation - Distributed generation advantages and needs - Radial distribution system protection: Fuse, circuit breakers, reclosers- Per-unit analysis, fault analysis, sequence component analysis, sequence models of distribution system components. Implications of DG on distribution system protection coordination.

UNIT II DISTRIBUTION SYSTEM LOADING

Introduction – Distribution system loading, line drop model, series voltage regulators and on line tap changers- Power quality requirements and source switching using SCR based static switches-Loop and secondary network distribution grids and impact of DG operation.

UNIT III RELAYING AND PROTECTION

Relaying and protection, distributed generation interconnection relaying, sensing using CTs and PTs- Intentional and unintentional islanding of distribution systems. Passive and active detection of unintentional islands, non detection zones - EMI considerations in DG applications.

UNIT IV DISTRIBUTED GENERATION PLANNING

DG planning and forecasting techniques - Load characteristics: Definitions - tariffs and metering of energy, cost implications of power quality, cost of energy and net present value calculations and implications on power converter design- Distribution Transformers: Types. Distribution substations and primary systems: Voltage drop and power loss calculations: Distribution feeder costs.

UNIT V DG INVERTERS CONTROL

Control of DG inverters, phase locked loops, current control and DC voltage control for stand alone and grid parallel operations. Protection of the converter.

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TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Dr. M.K. Khedkar, Dr.	A Textbook of Electric Power Distribution Automation	Laxmi Publications, Ltd	2010
	G.M. Dhole			

S No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Ned Mohan, Tore M. Undeland, William P. Robbins	Power Electronics: Converters, Applications and Design	Wiley	2002
2	Turan Gonen	Electric Power Distribution Systems	CRC Press	2006
3	Pabla, A. S	Electric Power Distribution	6th Edition, Tata McGraw-Hill Education	2011
4	M. V. Deshpande	Electrical Power System Design	Tata McGraw-Hill Education	2001

Course Objectives

- To introduce the concept of analyzing discrete time signals and systems in the time and frequency domain.
- To classify signals and systems and their mathematical representation.
- To analyze the discrete time systems.
- To study various transformation techniques and their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor and quantization effects.

Course Outcomes

1. Represent signals mathematically in continuous and discrete-time, and in the frequency domain.

2. Analyze discrete-time systems using z-transform.

3.Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.

4.Design digital filters for various applications.

5. Apply digital signal processing for the analysis of real-life signals.

6.Analysis the real time application of it

UNIT I INTRODUCTION

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

UNIT II DISCRETE TIME SYSTEM ANALYSIS

Discrete Fourier series, Fourier transform of discrete sequence, Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION

Discrete Fourier Transform and its properties - Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS

FIR design: Windowing Techniques - Rectangular, Hamming, Hanning – Need and choice of windows – Linear phase characteristics.

IIR design: Analog filter design - Butterworth filter design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

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UNIT V PROGRAMMABLE DSP CHIPS

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Architecture and features of TMS 320C54 signal processing chip – Overview of instruction set and addressing modes of TMS 320C54

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Proakis, J. G. and Manolakis, D. G	Digital Signal Processing Principles, Algorithms and Applications.	Pearson Education, New Delhi.	2003
2	Mitra, S.K	Digital Signal Processing – A Computer Based Approach	Tata McGraw Hill Publications, New Delhi.	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Alan V Oppenheim,	Discrete – Time Signal	Pearson Education,	2003
	Ronald W Schafer	Processing	New Delhi.	
	and John R Buck			
2	Venkataramani, B.,	Digital Signal	Tata McGraw Hill,	2003
	and Bhaskar, M.,	Processors, Architecture,	New Delhi.	
		Programming and		
		Applications.		
3	Salivahanan, S.,	Digital Signal Processing	Tata McGraw Hill	2003
	Vallavaraj, A.,		Publications,	
	Gnanapriya, C		New Delhi.	

WEBSITES

1. http://www.dspguide.com

2. http://www.dsptutor.freeuk.com

Course Objectives

- To study and gain knowledge about various sensors.
- To study and gain knowledge about controllers.
- To study the concept of sensors,
- To study the concept of actuators
- To study the various tuning controllers
- To study the application of SCADA.

Course Outcomes

- At the end of the course the student will be able to
- 1. Understand the concept of sensors,
- 2. Understand the concept of actuators
- 3. Analyze the various tuning controllers
- 4. Analyze the various advanced control techniques used in industrial automation.
- 5. Understand the application of SCADA.
- 6. Analyze the SCADA usuage in Industries.

UNIT I SENSORS, ACTUATORS

Sensors, Actuators and Signal conditioning Sensors: Displacement sensors, Force sensors, Ultrasonic sensors, Temperature sensors, Pressure sensors etc Actuators: Dc motors, Servo motors, Stepper motors, Piezo electric actuators, Pneumatic actuators etc. Signal Conditioning: Filtering, Amplifying, Isolation, ADC, DAC, Sensor protection circuits, Signal transmission and noise suppression, Estimation of errors and calibration.

UNIT II CONTROLLER TUNING

PI controller, PD controller, PID controller and tuning methods: Ziegler-Nichols tuning method, Cohen coon tuning method, Implementation of PID controllers (digital and analog).

UNIT III AUTOMATION

PLC (Programmable logic controllers): Overview, operation and architecture, PLC programming, Application examples. DCS (Distributed control systems): Overview, Advantages, Functional requirements of Distributed control systems, Communication for distributed control

UNIT IV APPLICATIONS

Application examples SCADA (supervisory control and data acquisition): Introduction to SCADA, SCADA system components, architecture and communication, SCADA applications.

UNIT V ADVANCED CONTROL TECHNIQUES

Feed forward control, Ratio control, Cascade control, Adaptive control, Duplex or split range control, Override control, internal mode control.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Krishna Kant	Computer-Based Industrial Control	2nd edition Prentice Hall of India Ltd	2003
2	Stephanopoulous	Chemical Process Control – Theory and Practice	Prentice Hall of India Ltd	2014
3	William C. Dunn	Fundamentals of Industrial Instrumentation and Process Control	TataMcGrawHill	2009

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Muhammad	Modern Automation Systems	University Science	2009
	Abdelati		Press	
2	Ogata	Modern Control Engineering	5 th edition, ,	2010
			Prentice Hall of	
			India	

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TOTAL: 45 HOURS

Course Objectives

- It deals with various types of Sensors & Transducers and their working principle
- It deals with resistive transducers
- It deals with capacitive transducers
- It deals with inductive transducers
- It deals with some of the miscellaneous transducers
- It deals with characteristics of transducers

Course Outcomes

At the end of the course the student will be able to understand all types of sensors and transducers.

- 1. Understand all types of sensors and transducers.
- 2. Justify the concept and working principle of different transducers and sensors
- 3 Justify the transducers that will be utilised in the electrical industries
- 4. Identify recent developments in transducer domain
- 5. Discover the knowledge for small technology up gradations in it
- 6. Analysis the real time application

UNIT I INTRODUCTION OF TRANSDUCERS

Transducer - Classification of transducers - Basic requirement of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS

Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs.

UNIT III RESISTIVE TRANSDUCERS

Potentiometer – Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell – Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer.

UNIT IV INDUCTIVE AND CAPACITIVE TRANSDUCER

Self inductive transducer – Mutual inductive transducers– LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

UNIT V MISCELLEANEOUS TRANSDUCERS

Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers.

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Sawhney A.K	A Course in Electrical and	18th Edition,	2007
		Electronics Measurements and	Dhanpat Rai &	
		Instrumentation	Company Private	
			Limited	
2	Renganathan. S	Transducer Engineering	Allied Publishers,	2003
	_		Chennai	

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Doebelin. E.A	Measurement Systems –	Tata McGraw Hill,	2000
		Applications and Design	New York	
2	Patranabis. D	Sensors and Transducers	PHI Learning Pvt.	2003
			Ltd.	
3	John. P, Bentley	Principles of Measurement	III Edition, Pearson	2000
		Systems	Education	
4	Murthy.D.V.S	Transducers and Instrumentation	Prentice Hall of	2001
	-		India	

Course Objectives

16BEEE5E12

- To study about the concept of intellectual property laws.
- To study about the trademarks and copy rights.
- To study trademarks and its importance
- To get the knowledge of principles of copyrights and the legal process
- To acquire the knowledge of Trade secrets and its security
- To gain various practical case studies of patent programme

Course Outcomes

- At the end of the course the student will be able to understand the concepts of IPR.
- Ability to need of trademarks and its importance
- To gain the knowledge of principles of copyrights and the legal process
- To acquire the knowledge of Trade secrets and its security
- To gain various practical case studies of patent programmes
- Ability of handling higher level management legality in patent and trading

UNIT I INTRODUCTION

Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool KitPara -Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law - Introduction to Cyber Law – Innovations and Inventions Trade related Intellectual Property Right.

UNIT II TRADE MARK

Introduction to Trade mark – Trade mark Registration Process – Post registration Procedures – Trade mark maintenance - Transfer of Rights - Inter partes Proceeding – Infringement - Dilution Ownership of Trade mark – Likelihood of confusion - Trademarks claims – Trademarks Litigations – International Trade mark Law.

UNIT III COPY RIGHTS

Introduction to Copyrights – – Principles of Copyright Principles -The subjects Matter of Copy right – The Rights Afforded by Copyright Law – Copy right Ownership, Transfer and duration – Right to prepare Derivative works – Rights of Distribution – Rights of Perform the work Publicity Copyright Formalities and Registrations - Limitions - Copyright disputes and International Copyright Law – Semiconductor Chip Protection Act.

UNIT IV TRADE SECRET

Introduction to Trade Secret – Maintaining Trade Secret – Physical Secrurity – Employee Limitation - Employee confidentiality agreement - Trade Secret Law - Unfair Competation – Trade Secret Letigation – Breach of Contract – Applying State Law.

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UNIT V CASE STUDIES

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	M.Ashok Kumar and Mohd.Iqbal Ali	Intellectual Property Right	Serials Publications	2008

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Arindam	Power Quality Enhancement	Springer, USA	2002
	Ghosh, and Gerard	usung Custom Power		
	Ledwich	Electronic Devices		

WEBSITES

1. www.iitk.ac.in/infocell/announce/electric_power

2. powerquality.eaton.com/india/?cx=203

ELECTIVE – III AND ELECTIVE- IV (ONLY APPLICABLE FOR SIXTH SEMESTER)

16BEEE6E01 COMPUTER ORGANIZATION AND ARCHITECTURE L T P C 3 0 0 3 Course Objectives

Course Outcomes:

- To study the various representations of data, register transfer language for micro operations and organizations and design of digital computer
- To teach the concept of micro program control unit ,CPU, stack and instruction formats
- To study the concepts of microprocessors, their principles and practices
- To study the write efficient programs in assembly language of the 8086 family of microprocessors.
- To illustrate the technique to communicate with input and output devices
- To study the organization and operation of various memories and memory

At the end of this course, students will demonstrate the ability to

- 1. Understand the concepts of microprocessors, their principles and practices.
- 2. Write efficient programs in assembly language of the 8086 family of microprocessors.
- 3. Organize a modern computer system and be able to relate it to real examples.
- 4. Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.
- 5. Implement embedded applications using ATOM processor.
- 6.Analysis the real time application of it.

UNIT I DATA REPRESENTATION, MICRO-OPERATIONS, ORGANIZATION AND DESIGN 9

Data representation: Data types, complements, fixed-point representation, floating-point representation, other binary codes, error detection codes. Register transfer and micro operations: Register transfer language, register transfer, bus and memory transfers, arithmetic micro- operations, logic micro-operations, shift micro-operations, arithmetic logic shift unit-Basic computer organization and design: Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, memory reference instructions, input output and interrupt. Complete computer description, design of basic computer, design of accumulator logic.

UNIT II CONTROL AND CENTRAL PROCESSING UNIT

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Micro programmed control: Control memory, address sequencing, micro-program example, design of control unit-Central processing unit: General register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, reduced instruction set computer.

UNIT III COMPUTER ARITHMETIC, PIPELINE AND VECTOR PROCESSING 9

Computer arithmetic: Addition and subtraction, multiplication algorithms, division algorithms, floating-point arithmetic operations, decimal arithmetic unit, decimal arithmetic operations- Pipeline

and vector processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, RISC pipeline, vector processing array processors.

UNIT IV INPUT-OUTPUT ORGANIZATION

Input-output organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access, input-output processor, serial communication.

UNIT V MEMORY ORGANIZATION

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware. TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Morris Mano	Computer System Architecture	3rd Edition, Pearson Education	2008
2	Vincent P.Heuring and Harry F.Jordan	Computer Systems Design and Architecture	Pearson Education Asia Publications, II Edition	2008.

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Andrew S.Tanenbaum	Structured Computer Organization'	V Edition, Prentice Hall of India/Pearson Education	2006
2	William Stallings	Computer Organization and Architecture'	VII Edition, Prentice Hall of India/Pearson Education	2008

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16BEEE6E02

Course Objectives

- To provide a clear understanding of embedded system terminologies and its devices.
- Various Embedded software Tools
- Design and architecture of Memories.
- Architecture of processor and memory organizations.
- Input/output interfacing
- Various processor scheduling algorithms.
- Basics of Real time operating systems.
- Introduction to PIC and its applications

Course Outcomes

At the end of the course the student will be able to program using embedded

- 1. Understand overview of embedded systems architecture
- 2. Acquire knowledge on embedded system, its hardware and software.
- 3. Gain knowledge on overview of Operating system
- 4. Discuss about task Management
- 5. Gain knowledge about semaphore management and message passing.
- 6. Gain knowledge about memory management.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS

Introduction to embedded real time systems – The build process for embedded systems – Types of memory – Memory management methods.

UNIT II EMBEDDED SYSTEM ORGANIZATION

Structural units in processor , selection of processor & memory devices – DMA – I/O devices : timer & counting devices – Serial communication using I2C , CAN USB buses – Parallel communication using ISA , PCI ,PCI/X buses – Device drivers.

UNIT III PROGRAMMING AND SCHEDULING

Intel I/O instructions – Synchronization - Transfer rate, latency; interrupt driven input and output -Nonmaskable interrupts, software interrupts, Preventing interrupts overrun - Disability interrupts. Multithreaded programming –Context Switching, Preemptive and non-preemptive multitasking, semaphores. Scheduling-thread states, pending threads, context switching.

UNIT IV REAL-TIME OPERATING SYSTEMS

Introduction to basic concepts of RTOS, Unix as a Real Time Operating system – Unix based Real Time operating system - Windows as a Real time operating system – POSIX – RTOS-Interrupt handling - A Survey of contemporary Real time Operating systems:PSOS, VRTX, VxWorks, QNX, 4C/OS-II, RT Linux – Benchmarking Real time systems – Basics.

UNIT V PIC MICROCONTROLLER BASED EMBEDDED SYSTEM DESIGN 9

PIC microcontroller – MBasic compiler and Development boards – The Basic Output and digital input – Applications.

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TOTAL 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rajkamal	Embedded system- Architecture, Programming, Design	TataMcgraw Hill	2003
2	Daniel W. Lewis	Fundamentals of Embedded Software	Prentice Hall of India	2004

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jack R Smith	Programming the PIC microcontroller with MBasic	Elsevier	2007
2	Tammy Noergaard	Embedded Systems Architecture	Elsevier	2006
3	Rajib Mall	Real-Time systems Theory and Practice	Pearson Education	2007
4	Sriram. V.Iyer & Pankaj Gupta	Embedded real time systems Programming	Tata McGraw Hill	2004

16BEEE6E03 PROGRAMMABLE LOGIC CONTROLLER AND ITS APPLICATIONS L T P C 3 0 0 3

Course Objectives

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To gain the knowledge of storage techniques in PLC
- To acquire the knowledge about how to handle the data and functions
- To study about flo charts of ladder and spray process system
- To understand the principles of PID.

Course Outcomes

- At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.
- To acquire the knowledge of storage techniques in PLC
- Students know how to handle the data and functions
- Students known about advanced controller in PLC applications
- Students gather real time industrial application of PLC
- Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data

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processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TOTAL: 45 HOURS

TEXT BOOKS

S.	Author(s)	Title of the Book	Publisher	Year of
No.	Name			Publication
1	JR Hackworth	Programmable Logic	Pearson	2006
	and F.D	Controllers – Programming		
	Hackworth – Jr	Method and Applications		

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John Webb and	Programmable Logic	Fifth edition, PHI	2002
	Ronald A Reiss	Controllers – Principle and		
		Applications		
2	W.Bolton	Programmable Logic	Elsevier Newnes	2006
		controller	Publications, Fourth	
			Edition	

WEBSITES

http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller

- To study about various network architecture
- To study and analyze about various switching.
- To study about web security and its need •
- To study about protocols and its controls •
- To study about subnetting and domains basics
- To study about real time need of network management •

Course Outcomes

At the end of the course the student will be able

- To understand the computer networks and network protocols.
- To gain switching mechanisms of various interlink networks
- To know web securities and its need in real time digital world
- To gather D-link concepts
- To acquire wireless communication software and its related devices
- Gather protocols of dealing network accessories

UNIT I INTRODUCTION

Network architecture – layers – Physical links – Channel access on links – Hybrid multiple access techniques - Issues in the data link layer - Framing - Error correction and detection - Link-level Flow Control

UNIT II WIRELESS NETWORKS

Medium access - CSMA - Ethernet - Token ring - FDDI - Wireless LAN - Bridges and Switche **UNIT III SWITCHING** Circuit switching vs. packet switching / Packet switched networks – IP – ARP – RARP – DHCP – ICMP - Queueing discipline - Routing algorithms - RIP - OSPF - Subnetting - CIDR -Interdomain routing – BGP – Ipv6 – Multicasting – Congestion avoidance in network layer **UNIT IV NETWORK PROTOCOLS** 9

UDP - TCP - Adaptive Flow Control - Adaptive Retransmission - Congestion control -Congestion avoidance – QoS

UNIT V WEB SECURITY

Email (SMTP, MIME, IMAP, POP3) - HTTP - DNS- SNMP - Telnet - FTP - Security - PGP -SSH

TEXT BOOK

TOTAL: 45 HOURS

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S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Larry L. Peterson,	Computer Networks: A	Third Edition, Morgan	2003
	Bruce S. Davie	Systems Approach	Kauffmann Publishers	
			Inc	

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S. No.	Author(s) Name	Title of the Book	Publisher	Year
1	James F. Kuross, Keith W. Ross	Computer Networking, A Top-Down Approach Featuring the Internet	Third Edition, Addison Wesley	2004
2	Nader F. Mir	Computer and Communication Networks	Pearson Education	2007
3	Comer	Computer Networks and Internets with Internet Applications	Fourth Edition, Pearson Education	2003
4	Andrew S. Tanenbaum	Computer Networks	Fourth Edition	2003
5	William Stallings	Data and Computer Communication	Sixth Edition, Pearson Education	2000

16BEEE6E05

Course

- To understand the various types of over voltages in power system and Protection methods.
- To study about generation of over voltages in laboratories.
- To know about measurement of over voltages.
- To study about the nature of Breakdown mechanism in solid, liquid and gaseous Dielectrics
 - To study about discussion on commercial insulates.
- To study about testing of power apparatus and insulation coordination

Course Outcomes

- 1. Identify the causes of over voltages and its effects and estimate the reflection and refractions of travelling waves in transmission lines
- 2. Discuss the various types of breakdown mechanisms and analyze the breakdown mechanisms in solid, liquid, gases and composite dielectrics
- 3. Explain the generation and design of different types of Generating circuits for high voltage and currents of AC, DC and impulse
- 4. Measure AC and DC high voltage and current using high resistance with series ammeter, dividers, peak voltmeter and generating voltmeters
- 5. Discuss the testing methodologies related to various high voltage equipment with reference to national and international standards
- 6. Estimate the AC and DC high voltage and current using CVT, electrostatic voltmeters, sphere gaps, high current shunts and digital techniques in high voltage measurement

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS

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Causes of over voltages and its effect on power system – Lightning, switching surges and temporary over voltages – protection against over voltages.

UNIT II ELECTRICAL BREAKDOWN IN GASES, LIQUIDS AND SOLIDS 9

Gaseous breakdown in uniform and non–uniform fields – corona discharges – Vacuum breakdown – conduction and breakdown in pure and commercial liquids – breakdown mechanisms in solid and composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS

Generation of High DC, AC, impulse voltages and currents. Tripping and control of impulse generator.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

Measurement of High voltages and High currents – digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING AND INSULATION COORDINATION 9

High voltage testing of electrical power apparatus – power frequency, impulse voltage and DC testing – International and Indian standards – Insulation Coordination.

TOTAL 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Naidu, M. S. and	High Voltage Engineering	Tata McGraw Hill,	2004
	Kamaraju, V		New Delhi	
2	Kuffel, E. and	High Voltage Engineering	Butterworth-Heinemann	2000
	Zaengl, W. S	Fundamentals		

REFERENCES

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Abdel-AlAm/Ani	High–Voltage Engineering:	CRC, Colorado,	2000
		Theory and Practice	USA	
2	Dieter Kind, Kurt	High Voltage Test Techniques	Newnes, NSW,	2000
	Feser		Australia	

WEBSITES

1. iopscience.iop.org 2. www.newagepublishers.com

Course Objectives

- To expose the students to the concepts of special electrical machines and analyze their performance and to impart knowledge on
- Construction and performance of synchronous reluctance motors.
- Principle of operation and performance of stepping motors .
- To study the knowledge on construction and operation of permanent magnet brushless D.C. motors.
- To study the real time need of special machines
- Construction, principle of operation and performance of switched reluctance motors, permanent magnet synchronous motors.

Course Outcomes

- 1. Analyze and design controllers for special Electrical Machines.
- 2. Acquire the knowledge on construction and operation of stepper motor.

3.Understand the concept of construction and operation of stepper switched reluctance motors.

4. Acquire the knowledge on construction and operation of permanent magnet brushless D.C. motors.

5.Acquire the knowledge on construction and operation of permanent magnet synchronous motors.

6. Determine a special Machine for a particular application.

UNIT I SYNCHRONOUS RELUCTANCE MOTORS

Constructional features – Types – Axial and radial air gap motors – Operating principle – Reluctance – Phasor diagram – Characteristics – Vernier motor – Driver circuits – Applications of AC motors.

UNIT II STEPPING MOTORS

Construction and Principle of operation – Types: Permanent Magnet, Hybrid and Variable reluctance motor – Single and multi stack configurations – Theory of torque predictions – Dynamic Characteristics – Driver circuits – Applications of stepper motors.

UNIT III SWITCHED RELUCTANCE MOTORS

Construction and Principle of operation – Torque prediction – Power controllers – Non–linear analysis – Microprocessor based control – Characteristics – Driver circuits.

UNIT IV PERMANENT MAGNET BRUSHLESS DC MOTORS

Construction and Principle of operation – Electronic Commutator – Difference between electronic and Mechanical Commutator – Types of PMBLDC motors – Magnetic circuit analysis – EMF and torque equations – Power controllers – Motor characteristics and control – Applications of DC motors.

UNIT V PERMANENT MAGNET SYNCHRONOUS MOTORS

Construction and Principle of operation – EMF and torque equations – Torque-speed characteristics – Reactance – Phasor diagram – Power controllers –Volt-ampere requirements of Converter – Self, Vector and Current control schemes.

TOTAL 45 HOURS

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TEXT BOOKS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	P.P.Acarnley	Stepping Motors, A Guide to Modern theory and practice	Peter Peregrines, London	2002
2	B K Bose	Modern Power Electronics & AC drives	Pearson	2002
3	T.Kenjo	Stepping motors and their microprocessor controls	Oxford University press, New Delhi	2000
4	Sen.P.C	Principles of Electrical	John willey & Sons,	2008
		Machines and Power Electronics	Second edition	-

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hughes	Electric Motors and	Affiliated East - West	2007
		Drives	Press Pvt., Ltd	
2	S. Heier	Grid Integration of Wind	Wiley	2006
		Energy Conversion		
		Systems		
3	Ali Emadi (Ed)	Handbook of Automotive	CRC Press	2005
		Power Electronics and		
		Motor Drives		
4	H A Toliyat, S	DSP Based Electro	CRC Press	2004
	Campbell	Mechanical Motion		
		Control		
5	Dubey.G.K	Fundamentals of Electric	Alpha Science	2008
		Drives	International Limited,	
			Second revised edition	

Course Objectives

- To expose the students to the basic concepts of optical fibres and their properties.
- To provide adequate knowledge about the Industrial applications of optical fibres.
- To expose the students to the Laser fundamentals.
- To study the source and detectors in optical system
- To provide adequate knowledge about Industrial application of lasers.
- To provide adequate knowledge about holography and Medical applications of Lasers.

Course Outcomes

At the end of the course the student will be understand

- the concept of fibre optics and about laser instruments.
- Introduce the characteristics of laser for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Gain knowledge in industrial application about optical fibre
- Develop the new strategies in laser technology in industries
- Acquire knowledge in advanced medical system utility under this technology

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors and splicers – Fiber termination – Optical sources – Optical detectors.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS

Laser for measurement of distance, length, velocity, acceleration, current,voltage and Atmospheric effect – Material processing – Laser heating, welding,melting and trimming of material – Removal and vaporization.

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UNIT V HOLOGRAM AND MEDICAL APPLICATIONS

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Holography – Basic principle - Methods – Holographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

TOTAL: 45 HOURS

TEXT BOOKS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	J.M. Senior	Optical Fibre	Prentice Hall of India –	2013
		Communication –	2 nd edition	
		Principles and Practice'		
2	J. Wilson and	Introduction to Opto	Prentice Hall of India	2001
	J.F.B. Hawkes	Electronics'		

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	G. Keiser	Optical Fibre	McGraw Hill – 4 th edition	2012
		Communication'		
2	M. Arumugam	Optical Fibre	Anuradha Publications	2002
	_	Communication and		
		Sensors'		

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• To understand the mobile channel environment, communication techniques and wireless standards for mobile communication.

- To learn cellular concept including handoff mechanism, cell coverage and capacity.
- To understand the mobile radio propagation models for indoor and outdoor conditions.
- To study the digital modulation and equalization techniques suitable for mobile communication.
- To learn speech coding and multiple access techniques for mobile communication.
- To familiarize with the international wireless network standards.

Course Outcomes

At the end of the course the student will be able to understand the cellular concept, mobile propagation, wireless systems and standards.

- Understand past, present and future trends in mobile communication.
- Gain knowledge about mobile cellular communication
- Understand various standards in use for wireless communication and its application.
- Demonstrate some basic application of GPS.
- Gain knowledge about RADAR working and its applications
- Analysis the real time application of it.

UNIT I CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS 9

Introduction to wireless communication: Evolution of Mobile Communication, mobile radio systems – Examples, trends in cellular radio and personal communications. Cellular concept: Frequency reuse, channel assignment hand off, interference and system capacity, tracking and grade of service, improving coverage and capacity in cellular systems.

UNIT II MOBILE RADIO PROPAGATION

Free space propagation model, reflection, diffraction, scattering, link budget design, outdoor propagation models, indoor propagation models, small scale multipath propagation, impulse model, small scale multipath measurements, parameters of mobile multipath channels, types of small scale fading.

UNIT III MODULATION TECHNIQUES AND EQUALIZATION

Modulation techniques: Minimum Shift Keying (MSK), Gaussian MSK, M–array QAM, Performance of MSK modulation in slow–flat fading channels. Equalization: Survey of equalization techniques, linear equalization, non–linear equalization, algorithms for adaptive equalization. Diversity Techniques, RAKE receiver.

UNIT IV CODING AND MULTIPLE ACCESS TECHNIQUES

Coding: Vocoders, linear predictive coders, selection of speech coders for mobile communication, GSM coders. Multiple access techniques: FDMA, TDMA, CDMA, SDMA, capacity of cellular CDMA.

UNIT V WIRELESS SYSTEMS AND STANDARDS

Second generation and third generation wireless network and standards, WLL, blue tooth, GSM, IS-95 and DECT.

TOTAL: 45 HOURS

TEXT BOOK

S.	Author(s)	Title of the Book	Publisher	Year of
No.	Name			Publication
1	Rappaport, T.	Wireless	Prentice Hall of India,	2003
	S	Communications:	New Delhi	
		Principles and Practice		
2	Blake, R	Wireless Communication	Thomson Delmar,	2003
		Technology	New York	

REFERENCES

S.	Author(s) Name	Title of theBbook	Publisher	Year of
No.				Publication
1	Stephen G	Digital Modulation and	Pearson Education,	2003
	Wilson	Coding	New Delhi	
2	Jochen Schiller	Mobile Communications	Addison Wesley, Boston	2003
3	Mischa Schwartz	Mobile Wireless	Cambridge University	2005
		Communications	Press, Cambridge, UK	

WEBSITES

- 1. www.pearson.ch/download/media/9780130422323.pdf
- 2. www.wtec.org/loyola/wireless/chapter02.pdf

Course Objectives

At the end of the course the student will be understand

- The concept of fibre optics and about laser instruments.
- Introduce the characteristics of laser for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Gain knowledge in industrial application about optical fibre
- Develop the new strategies in laser technology in industries
- Acquire knowledge in advanced medical system utility under this technology

Course Outcomes

- At the end of the course the student will be able to understand the concept of power converters, resonant converters and about harmonics.
- At the end of the course the student will be able to understand the concept of capacitors and inductor design.
- To understand the working of Power Converters and components of low-voltage electrical installation
- To acquire knowledge of Steady state and dynamic functions in various applications
- To know the importance of power quality system in advanced equipments
- To know the design of conversion ratio

UNIT I INTRODUCTION

Reactive elements in power electronics system- electromagnetics – design of inductor- design of transformer – capacitors for power electronic applications – types of capacitor

UNIT II POWER CONVERTERS

Switched mode power converters – continuous and discontinues mode of operation in buck, boost and boost-buck converter – isolated DC to DC: forward converter- pushpull converter – fly back converter

UNIT III STEADY STATE AND DYNAMIC FUNCTIONS

Pulse width modulated converter: average modeled of the converter – steady state solution – transfer function of the converter- generalized stste space mode of the converter – linear small signal model – dynamic functions of the converter.

UNIT IV RESONANT CONVERTERS

Resonant converters – ZCS Resonant converters – L and M type – ZVS Resonant converterscomparison between ZCS and ZVS converters – resonant switch converters – buck converter with zero current switching – operation of the circuit – conversion ratio of the converter – boost converter with zero voltage switching

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UNIT V HARMONICS

Sub harmonic instability in current programmed control – determination of duty ratio for current programmed control – power circuit of UPF rectifiers – average current mode control – resistor emulator UPF rectifiers

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Keng C. Wu	Switch-Mode Power Converters: Design and Analysis	Elsevier Academic Press	2006

REFERENCE BOOKS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Issa Batarseh	Power Electronic Circuits	John Wiley	2004
2	Philip T Krein	Elements of Power	Oxford Press	2014
		Electronics		

- The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance
- To study about instruments for physiological measurements
- To study about devices of non–electrical devices.
- To study about modern methods of imaging techniques.
- To study about nervous system
- To study about medical assistance / techniques and therapeutic

Course Outcomes

At the end of the course the student will be to

- Acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Methods of different transducers used.
- Understand the student to the various sensing and measurement devices of electrical origin.
- Analysis the latest ideas on devices of non-electrical devices.
- Analysis the important and modern methods of imaging techniques.
- Analysis latest knowledge of medical assistance / techniques and therapeutic equipment.
- Analysis the real time application of it

UNIT I PHYSIOLOGY AND TRANSDUCERS

Cell and its structure – Action and resting potential – Potential propagation of action potential – Sodium pump – Nervous system – CNS – PNS – Nerve cell – Synapse – Cardio pulmonary system – Physiology of heart and lungs – Circulation and respiration – Transducers – Different types – Piezo electric, ultrasonic, resistive, capacitive and inductive transducers – Selection criteria.

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS

Basic components of a biomedical system – Electrodes – Micro, needle and surface electrodes – Amplifiers – differential, chopper, Isolation and Pre-amplifiers. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms.

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS

Measurement of blood pressure – Cardiac output – Cardiac rate – Heart sound – Respiratory rate – Gas volume – Flow rate of CO_2 , O_2 in exhaust air – pH of blood, ESR and GSR measurements – Plethysmography.

UNIT IV MEDICAL IMAGING AND PATIENT MONITORING SYSTEM

X-ray machine – Radiographic and fluoroscopic techniques – Computer Tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety.

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UNIT V ASSISTING AND THERAPEUTIC EQUIPMENT

Pacemakers – Defibrillators – Ventillators – Nerve and muscle stimulators – Diathermy – Heart-Lung machine – Audio meters – Dializers.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Leslie Cromwell, Fred J Weibell, Erich A Pfeiffer	Bio–Medical Instrumentation and Measurements	Pearson Education, India	2002
2	Khandpur, R. S	Handbook of Bio–Medical instrumentation	Tata McGraw Hill Publishing Co. Ltd., India	2003

REFERENCES

S.	Author(s)	Title of the Book	Publisher	Year of
No.	Name			Publication
1	Arumugam, M	Bio–Medical Instrumentation	Anuradha Agencies,	2003
			Kumbakonam	
2	Webster, J	Medical Instrumentation	John Wiley and	1995
			Sons, New York	
3	Rajarao.C. and	Principles of Medical Electronics	Universities Press	2000
	Guha, S.K	and Bio–medical	India	
		Instrumentation	Ltd., India	
4	Khandpur, R. S	Biomedical Instrumentation:	McGraw-Hill	2004
		Technology and Applications	Education, Europe	

WEBSITES

1. www.biopac.com

2. www.britannica.com/EBchecked/topic/674616/transducer

MODERN SEMICONDUCTOR DEVICES **16BEEE6E11**

Course Objectives

- To study the power semiconductor switches. •
- To study about the characteristics and applications of Power diode, power BJT. • Thyristor, GTO, IGBT, MOSFET.
- To study the real time application of it.
- To study the basics of thyristor technologies
- To study the new semiconductor material of power devices
- To study the safe operating area of the power devices

Course Outcomes

At the end of the course the student will be able to

- Understand the concepts of modern semiconductor devices
- Understand the different characteristics of conductor devices
- Analysis the real time application of it.
- To learn deep knowledge of thyristor technologies
- To study about real time applications of inverters and rectifiers
- To learn about protection of device circuits

UNIT I **OVERVIEW OF POWER SEMICONDUCTOR SWITCHES**

Introduction - Diodes, Thyristors, BJTs, JFETs, MOSFETs, GTOs, IGBTs, Comparison of these as switching devices, Drive and Protection circuit for these devices - New Semiconductor materials for Power devices.

UNIT II POWER DIODE AND POWER BJT

Basic structure and I-V & Switching characteristics of Power diode, Schottky diode - Structure and switching characteristics of Power BJT - Breakdown voltage considerations - Safe operating area -Drive circuits for BJT – Snubber design for Power diode.

UNIT III THYRISTORS AND GTOs

Basic structures - I-V characteristics - Physics of device operation - Switching characteristics of Thyristors and GTOs - Derive circuits - Snubber circuits for Thyristors and GTOs - Over current protection of GTO.

UNIT IV IGBT AND POWER JFET & MOSFETS

Basic structures - I-V characteristics, physics of device operation - Switching characteristics - Safe operating area of IGBT and Power JFET & MOSFET - Derive circuits and Protection.

UNIT V APPLICATIONS

Single phase rectifiers and Three phase rectifiers using Diodes and Thyristors, Choppers, Inverters using GTOs-IGBTs and power JFETs & MOSFETs.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s)	Title of the Book	Publisher	Year of
	Name			Publication
1	Mohan. Net al	Power Electronics: Converters,	John Wiley and Sons,	2002
		Applications and Design	New York, Third	
			Edition	
2	Rashid M.H	Power Electronics Circuits,	Prentice Hall India,	2004
		Devices and Applications	Third edition, New	
			Delhi	

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	M.D. Singh and	Power Electronics	Tata McGraw Hill,	2008
	K.B.Khanchandani		New Delhi, Second	
			Edition	
2	Donald A.Neamen	Semiconductor Physics and	Tata McGraw Hill,	2011
		Devices	New Delhi, Fourth	
			Edition	
3	Kassakian, J.G.et.al	Principles of Power	Pearson Education	2010
		Electronics	India	

PROFESSIONAL ELECTIVE- V

(ONLY APPLICABLE FOR SEVENTH SEMESTER)

16BEEE7E01 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS L T P C 3 0 0 3

Course Objectives

- To study about representing knowledge.
- To study the reasoning and decision making in uncertain world. To construct plans and methods for generating knowledge.
- To study the concepts of expert systems.
- To study the knowledge about the various searching strategies
- To study about first order logic
- To study the need of real time world about robotics

Course Outcomes

At the end of the course the student will be able to

- understand concepts about artificial intelligence, reasoning and also about expert tools.
- To understand about representing knowledge.
- To acquire knowledge about the reasoning and decision making in uncertain wor construct plans and methods for generating knowledge.
- To acquire knowledge about the concepts of expert systems.
- To acquire knowledge about the various searching strategies for solutions

UNIT I INTRODUCTION

Introduction to AI: Intelligent agents – Perception – Natural language processing – Problem solving agents – Searching for solutions: Uniformed search strategies – Informed search strategies.

UNIT II **KNOWLEDGE AND REASONING**

Adversarial search – Optimal and imperfect decisions – Alpha, Beta pruning – Logical agents: Propositional logic - First order logic - Syntax and semantics - Using first order logic - Inference in first order logic.

UNIT III UNCERTAIN KNOWLEDGE AND REASONING

Uncertainty - Acting under uncertainty - Basic probability notation - Axioms of probability -Baye's rule – Probabilistic reasoning – Making simple decisions.

UNIT IV PLANNING AND LEARNING

Planning: Planning problem – Partial order planning – Planning and acting in non-deterministic

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domains.

Learning: Learning decision trees – Knowledge in learning – Neural networks – Reinforcement learning – Passive and active.

UNIT V EXPERT SYSTEMS

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Definition – Features of an expert system – Organization – Characteristics – Prospector – Knowledge Representation in expert systems – Expert system tools – MYCIN – EMYCIN.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Stuart Russel and Peter Norvig	Artificial Intelligence A Modern Approach	Prentice Hall India, New Delhi	2003
2	Donald A Waterman	A Guide to Expert Systems	Pearson Education, India	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	George Luger F	Artificial Intelligence – Structures and Strategies for Complex Problem Solving	Pearson Education, New Delhi	2002
2	Janakiraman, Sarukesi, K	Foundations of Artificial Intelligence and Expert Systems	Macmillan Series in Computer Science	2001
3	Patterson, W	Introduction to Artificial Intelligence and Expert Systems	Prentice Hallof India, New Delhi	2003
4	Michael Negnevitsky	Artificial Intelligence: A Guide to Intelligent Systems	Addison Wesley, Harlow, England	2005

WEBSITES

1. http://nptel.iitm.ac.in/video.php/courseId=1084

2. www.pes.edu

Course Objectives

- To study about HVDC systems
- To study about HVDC control systems
- To Study the control strategies used in HVdc transmission system.
- To Study the improvement of power system stability using an HVdc system.
- To Study and Analysis the components of HVDC system
- To study about aspects of EHVAC systems

Course Outcomes

At the end of the course the student will

- Justify the advantages of dc transmission over ac transmission.
- Reproduce the operation of Line Commutated Converters and Voltage Source Converters.
- Evaluate the control strategies used in HVdc transmission system.
- Identify and propose the improvement of power system stability using an HVdc system.
- gain knowledge about HVDC transmission, converters used and about EHVAC systems.
- Analysis the real time application of it.

UNIT I EHV TRANSMISSION

Introduction-Necessity for EHV Transmission-Problems involved in EHV Transmission-Operational Aspects of EHV power transmission-Compensation of EHV systems-Gas insulated EHV lines-Environmental and biological aspects.

UNIT II GENERAL BACKGROUND OF EHVAC TRANSMISSION SYSTEMS 9

Standard Voltage levels for Transmission lines-Hierarchical levels of Transmission Network-Average values of line parameters-Power handling capacity and line losses-Cost of Transmission line and Equipments-Mechanical consideration in line performance-Comparison of Overhead and Underground lines-Examples of Giant power pools in the world.

UNIT III ASPECTS OF EHVAC SYSTEM

Power Transferability of Ac line – Line losses-Conductor cost -Transient stability of Ac line – control of power flow through line Right – of- way(Row)-Corona- Towers(support)-Insulation Coordination and surge arrester protection-Line insulation-Clearance and Creepage distances.

UNIT IV HVDCTRANSMISSION SYSTEMS

Choice of HVDC Transmission - Comparison of AC and DC Transmission – Economics of DC power Transmission, Technical Performance and Reliability – Description of HVDC Converter station- Types of HVDC Links- Merits and Limitations of HVDC System - Applications -Modern Trends in HVDC transmission –Case Studies of HVDC links in the world.

UNIT V CONVERTERS AND HVDC SYSTEM CONTROL

Pulse number - Choice of Converter Configuration - Simplified analysis of Graetz circuit -

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Principles of HVDC link Control –DC Breaker - Harmonic Elimination – AC and DC Filter design –Protection Systems in HVDC Substation-HVDC Simulator.

TOTAL 45 HOURS

TEXT BOOKS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Naidu, M. S. and	High Voltage Engineering	Tata McGraw Hill,	2004
	Kamaraju, V		New Delhi	
2	Kuffel, E. and	High Voltage Engineering	Butterworth-Heinemann	2000
	Zaengl, W. S	Fundamentals		

REFERENCES

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Abdel-AlAm/Ani	High–Voltage Engineering: Theory and Practice	CRC , Colorado, USA	2000
2	Dieter Kind, Kurt Feser	High Voltage Test Techniques	Newnes, NSW, Australia	2000

WEBSITES

1. iopscience.iop.org

2. www.newagepublishers.com

Course Objectives

- To study about the economic aspects.
- To study about the economic dispatch and operation.
- To study about stability constraints in a synchronous grid.
- To study the methods to control the voltage, frequency.
- To study the problem formulation of power flow
- To study the basics of power system economics

Course Outcomes

- At the end of the course student will be able to .
- 1. Understand the concept of power generation economics
- 2. Understand stability constraints in a synchronous grid.
- 3. Understand methods to control the voltage, frequency.
- 4. Understand methods to control the power flow.
- 5. Understand the monitoring and control of a power system.
- 6. Understand the basics of power system economics.

UNIT I ECONOMIC CONSIDERATIONS

Cost of electrical energy-expressions for cost of electrical energy-capital-interest-depreciationdifferent methods-factors affecting cost of operation-number and size of generating units-importance of high load factor-importance of power factor improvement-most economical power factor-meeting the KW demand on power stations-power system tariffs.

UNIT II ECONOMIC DISPATCH

Economic scheduling of generators in a plant-economic coordination of generation among a number of plants-losses neglected, with generator limits, losses included-losses of economy in incremental cost data- automatic load dispatch in power systems-analog and digital computers for application to load dispatch.

UNIT III ECONOMIC OPERATION

General loss formula-evolution of incremental transmission loss rate-method of calculation of loss coefficients-systematic development of transmission loss formula-Transmission loss as a function of plant generation, voltage and phase angle-economic dispatch computers.

UNIT IV ECONOMIC CONTROL

Interconnected operation-economic operation of hydro thermal power plants- λ - γ iteration schemegradient approach-modeling and solution approach to short term and long term hydro-thermal scheduling problem using dynamic programming.

UNIT V OPTIMAL POWER FLOWS

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Problem formulation-cost minimization-loss minimization-solution using NLP and successive LP methods.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kirchmayer. L.K	Economic operation of power system	John Wiley & Sons, New York	1953
2	Kirchmayer. L.K	Economic control of Interconnected Systems	Tata McGraw Hill Publishing Company, New Delhi	1959

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Allen J Wood and B	Power Generation, Operation	John Wiley & Sons, New	1984
	F Wollenberg	and Control	York	
2	I J Nagrath and D P	Modern Power System	Tata McGraw Hill,	-
	Kothari	Analysis	New Delhi.	

POWER SYSTEM RESTRUCTURING AND DEREGULATION **16BEEE7E04**

LTPC3003

Course Objectives

- To study about key issues in electric utilities restructuring. •
- To study about open access same time information systems.
- Gain the knowledge about power system restructure. •
- To study about ISO and its types, roles. •
- To known about electricity markets •
- To study about knowledge of various trades

Course Outcomes

- At the end of the course student will be able to
- Analysis about electric energy trading, electric pricing.
- Analysis about open access same time information systems. •
- Gain the knowledge about power system restructure. ٠
- Analysis the real time application of it •
- Acquiring knowledge of embedded cost and pricing models in various countries
- Acquiring knowledge of various trades

UNIT I

Deregulation Of Electric Utilities - Introduction-Unbundling-Wheeling-Traditional Central utility model-Reform motivations-Separation of Ownership and operation- competition and direct access in the Electricity market -ISO-components of ISO-types of ISO-role of ISO-Electric utility market in different countries.

UNIT II

Transmission Expansion In The New Environment - Introduction - role of transmission planning vertically integrated utility - three models of electricity market - Profit transmission planning - pool bilateral trades – multilateral trades.

UNIT III

Transmission Pricing In Open Access System - Introduction - rolled in pricing methods - marginal pricing method – embedded cost recovery – pricing models in different countries.

UNIT IV

Total transfer capability - CBM and TRM - Available transfer capability (ATC) - methods to compute ATC – concept of congestion management – inter and inter zone congestion – congestion pricing management - Transmission congestion contracts - Ancillary services.

UNIT V

Salient features of Indian Electricity Act 2003 - TSO - Availability based tariff - Electric supply industry structure under deregulation in India - regulatory and policy development in Indian power Sector – Opportunities for IPPs and CPPs under electricity Act 2003.

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TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Wood and Wollenberg	Power system operation control	second edition, John Wiley sons	1996
2	Loi Lei Lai	Power system Restructuring and Regulation	John Wiley sons	2001

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Michael Einhorn and Riaz Siddiqi	Electricity Transmission Pricing And Technology	Kluwer Academic publishers	1996
2	M.Illic, F.Galiana and L.Fink	Power Systems Restructuring : Engineering and Economics	Kluwer Academic Publishers	2000
3	M.Shahidehpour and M.Alomoush	Restructuring Electrical Power Systems	Marcel Decker Inc.	2001

Course Objectives

- To study the production of voltages sags, over voltages and harmonics and • methods of control.
- To study various methods of power quality monitoring. •
- To understand the concept of power and power factor in single phase and three phase systems supplying non linear loads
- To understand the conventional compensation techniques used for power factor • correction and load voltage regulation.
- To understand the active compensation techniques used for power factor correction. •
- To understand the active compensation techniques used for load voltage regulation.

Course Outcomes

At the end of the course the student will be able to 1. Evaluate the characteristics of ac transmission 2. Reproduce the effect of shunt and series reactive compensation. 3. Justify the working principles of FACTS devices and their operating characteristics. 4. Reproduce the basic concepts of power quality. 5. Rewrite the concept of Harmonics 6. Reproduce and justify the working principles of devices to improve power quality.

INTRODUCTION TO POWER QUALITY UNIT I

Terms and definitions: Overloading, under voltage, sustained interruption; sags and swells; waveform distortion, Total Harmonic Distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT II VOLTAGE SAGS AND INTERRUPTIONS

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT III OVER VOLTAGES

Sources of over voltages: Capacitor switching, lightning, ferro resonance; mitigation of voltage swells: Surge arresters, low pass filters, power conditioners – Lightning protection, shielding, line arresters, protection of transformers and cables, computer analysis tools for transients, PSCAD and EMTP.

UNIT IV HARMONICS

Harmonic distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING

Monitoring considerations: Power line disturbance analyzer, power quality measurement equipment, harmonic / spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

TOTAL 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Roger C Dugan,	Electrical Power Systems	McGraw Hill,	2003
	Mark, F.,	Quality	New York	
	McGranagham, Surya			
	Santoso, Wayne			
	Beaty, H			
2	C. Sankaran	Power Quality	CRC Press, Florida	2002

Course Objectives

- To learn about the controlling of excitation system and speed governing system.
- To impart knowledge on dynamic modeling of a synchronous machine in detail
- To describe the modeling of excitation and speed governing system in detail.
- To understand the fundamental concepts of stability of dynamic systems and its classification.
- To understand and enhance small signal stability problem of power systems.Model different power system components for the study of stability
- To Study the methods to improve stability.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- 1. Understand the problem of power system stability and its impact on the system.
- 2. Analyze linear dynamical systems and use of numerical integration methods.
- 3.Model different power system components for the study of stability.

Understand the methods to improve stability.

- 4. Understand real time difficulties in machine analysis
- 5. To get known about modelling system and its control
- 6. To understand the transient and dynamic stability of power systems.

UNIT I INTRODUCTION

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

UNIT II MACHINE MODELING

Park's transformation- flux linkage equations, current space model- per unit conversionnormalizing the equations- equivalent circuit- flux linkage state space model- Simplified models (one axis and constant flux linkage)- steady state equations and phasor diagrams.

UNIT III MACHINE CONTROLLERS

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

UNIT IV TRANSIENT STABILITY

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

UNIT V DYNAMIC STABILITY

System response to small disturbances- Linear model of the unregulated synchronous machine and its modes of oscillation- regulated synchronous machine- distribution of power impact-linearization of the load equation for the one machine problem – Simplified linear model- effect of excitation on dynamic stability- approximate system representation- supplementary stabilizing signals- dynamic performance measure- small signal performance measures.

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TOTAL: 45 HOURS

TEXT BOOKS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Anderson.P.M	Power System Control and	Galgotia	2003
	and Fouad.A.A	Stability	Publications, New	
			Delhi	

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Pai. M.A and Sauer.W	Power System Dynamics and Stability	Pearson Education Asia, India	2002

16BEEE7E07 COMPUTER AIDED ANALYSIS AND DESIGN OF ELECTRICAL APPARATUS L T P C 3 0 0 3

Course Objectives

- To study the structure and behaviour of processors, memories and input and output units and to study their interactions.
- To get basic knowledge on geometric modeling
- To study the graphic transformation needs
- To study about the basics of parametric design and object representation
- To get basic knowledge in product design and development.
- To study about 3D design introduction

Course Outcomes

At the end of the course the student will be able to

- Draw electrical drawings using CAD.
- Acquire basic knowledge on geometric modeling
- Acquire knowledge on graphic transformation needs
- Gaining CAD software application in engineering
- Gaining basics of parametric design and object representation
- Analyse the real time application of it

UNIT I INTRODUCTION

Conventional design methodology overview – Computer aided design aspects – Need for CAD – Nature of design problems- Analysis and synthesis approaches-advantages.

UNIT II FINITE ELEMENT ANALYSIS

Mathematical formulation – Discretisation – Shape functions – Stiffness matrix – Solution techniques – Post processing.

UNIT III CAD PACKAGES

Recent developments – Preprocessing – Modeling - Meshing – Boundary conditions - Material characteristics – Problem formulation – Solution – Post processing.

UNIT IV CAD SOFTWARE

Program files – Installation – Screen menu structure_ Fixing the size of a drawing – Set up option-On line help- Text fonts, Shapes – Blocks – Copy – Array- Erasing facilities -Editing – Fill – Zoom pan – Hatching – Isoplane – Elevation – View point – Dimension techniques – Introduction to 3D drawing.

UNIT V DESIGN EXAMPLES

Design of actuator – Solenoid -Transformer - Induction motor – Synchronous machines - Switched reluctance motor.

TOTAL: 45 HOURS

TEXT BOOKS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication

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1	P.P. Silvester and Ferrari	Finite Element for Electrical Engineers	Cambridge University Press, 3 rd edition	2012
2	D.A. Lowther and P.P. Silvester	Computer Aided Design in Magnetics	Springer; Softcover reprint of the original 1st ed. 1986 edition	2011

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sham Tickoo	AutoCAD 2002 with	Tata McGraw Hill	2001
		applications	Publishing Company limited, New Delhi	

16BEEE7E08 DIGITAL SYSTEM DESIGN USING VHDL

Course Objectives

- To introduce design concept and VHDL. •
- To study implementation techniques using various PLDs. •
- To study the design of various combinational, synchronous and asynchronous circuits.
- To study about design combinational and sequential circuits. •
- To study about CAD tools
- To expose the students to design and testing. •

Course Outcomes

At the end of the course the student will be able

- To understand the VHDL principles. •
- Students will be able to design combinational and sequential circuits.
- Understand the implementation techniques using various PLDs.
- To analysis the design of various combinational, synchronous and asynchronous circuits.
- To analysis the students to design and testing.
- Analysis the real time application of it.

UNIT I **INTRODUCTION TO DESIGN**

Design concepts – Design Process, design of Digital hardware, Variables and functions, truth tables, Boolean Algebra – Synthesis using Gates – Introduction to CAD Tools – VHDL.

UNIT II IMPLEMENTATION TECHNOLOGY

MOS Logic gates – PLDs – practical aspects, implementation details for SPLDs, CPLDs and FPGAs, optimized implementation of logic functions - multilevel synthesis, analysis of multilevel circuits - minimization techniques.

DESIGN OF COMBINATIONAL CIRUITS UNIT III

Number representation – signed, unsigned, combinational circuits – adder, multiplier, multiplexer, decoder and encoder, code converters - using signal assignment statements - concurrent and sequential – process and case statements, operators.

UNIT IV DESIGN OF SEQUENTIAL CIRCUITS

Latch – Flip-flops, registers and counters, finite state machines using CAD tools. Basic design steps with examples - Design of simple processor, vending machine controller.

UNIT V **DIGITAL SYSTEM DESIGN**

Building block circuits – Design examples – clock synchronization, testing of logic circuits – fault model, test set - path sensitizing, testing of sequential circuits.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Stephen Brown,	Fundamentals of digital logic	Tata McGraw-Hill	2009
	Zvonko Vranesic	design with VHDL	Publishing company	
			limited	
2	Volnei.A.Pedroni	Circuit design with VHDL	PHI Learning Private	2009
		_	Limited	

S. No.	Author(s)	Title of the Book	Publisher	Year of
	Name			Publication
1	Douglas L.	VHDL Programming by	Tata McGraw-Hill	2009
	Perry	example	Publishing company	
			limited	
2	J.Bhasker	A VHDL primer	Prentice-Hall India	2003
			Learning Private	
			Limited	

Course Objectives

- To have knowledge on optimization techniques applied to power systems
- To understand the different evolutionary computation techniques
- To study about optimal power flow problems
- To study about evolution computation techniques
- To study about the basics of MOOP
- To study about the solution of OPF

Course Outcomes

- At the end of the course the students will be able to understand the various optimization techniques.
- To get knowledge in optimization problems
- Acquire knowledge about power flow problem and solutions
- Experience in various algorithm and programming
- Gaining knowledge in velocity updation principle
- Gain knowledge about Economic emission dispatch

UNIT I OPTIMIZATION FUNDAMENTALS

Definition- Classification of optimization problems- Unconstrained and Constrained optimization-Optimality conditions- Classical Optimization techniques.

UNIT II OPTIMAL POWER SYSTEM OPERATION

Economic Dispatch problem-Unit commitment-Optimal Power Flow Problem- Solution Using Classical methods

UNIT III EVOLUTIONARY COMPUTATION TECHNIQUES

Evolution in nature-Fundamentals of Evolutionary algorithms-Working Principles of Genetic Algorithm- Evolutionary Strategy and Evolutionary Programming-Genetic Operators-Selection, Crossover and Mutation-Issues in GA implementation-GA solution of economic dispatch and unit commitment.

UNIT IV PARTICLE SWARM OPTIMIZATION

Fundamental principle-Velocity Updating-Advanced operators-Hybrid approaches Implementation issues-Solution of OPF problem

UNIT V MULTI OBJECTIVE OPTIMIZATION

Concept of pareto optimality-Conventional approaches for MOOP-Multi objective GA-Fitness assignment-Sharing function-Economic Emission dispatch using MOGA

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s)	Title of the Book	Publisher	Year of
	Name			Publication

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1	Kalyanmoy Deb	Multi objective optimization	John Wiley and Sons	2008
		using Evolutionary Algorithms		
2	D.P.Kothari and	Power System Optimization	2nd Edition, PHI	2010
	J.S.Dhillon		learning private	
			limited	

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Carlos A.Coello	Evolutionary Algorithms for	2 nd Edition,	2007
	Coello, Gary	solving Multi Objective	Springer	
	B.Lamont, David	Problems		
	A.Van Veldhuizen			
2	Kwang	Modern heuristic optimization	John Wiley and Sons	2008
	Y.Lee,Mohammed	techniques		
	A.El Sharkawi			

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Course Objectives

- To create an awareness on Operating Systems.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To study about memory management
- To study about integration of hardware and software
- To know about application procedures of RTOS

Course Outcomes

At the end of the course the students will be able to

- Understand overview of embedded systems architecture
- Acquire knowledge on embedded system, its hardware and software.
- Gain knowledge on overview of Operating system
- Discuss about task Management
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management.

UNIT I INTRODUCTION TO EMBEDDED SYSTEM

Introduction - Embedded systems description, definition, design considerations & requirements - Overview of Embedded system Architecture (CISC and RISC) -Categories of Embedded Systems - Embedded processor selection & tradeoffs - Embedded design life cycle - Product specifications - Hardware/software partitioning - Iterations and implementation - Hardware software integration - Product testing techniques – ARM 7.

UNIT II OPERATING SYSTEM OVERVIEW

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-pre-emptive Kernels - Pre-emptive Kernels – Re-entrancy- Reentrant Functions – Round Robin Scheduling - Task Priorities - Static Priorities – Mutual Exclusion – Deadlock – Intertask Communication – Message Mailboxes – Message Queues -Interrupts - Task Management – Memory Management - Time Management – Clock Ticks.

UNIT III TASK MANAGEMENT

Introduction - μ C/OS-II Features - Goals of μ C/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under μ C/OS-II – Clock Tick - μ C/OS-II Initialisation. Task Management: Creating Tasks – Task Stacks – Stack Checking – Task's Priority – Suspending Task – Resuming Task. Time Management: Delaying a Task – Resuming a Delayed Task – System Time. Event Control Blocks- Placing a Task in the ECB Wait List – Removing a Task from an ECB wait List.

UNIT IV SEMAPHORE MANAGEMENT

Semaphore Management Overview – Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox – Waiting for a Message box – Sending Message to a Mailbox-Status of Mailbox Message Queue Management: Creating Message Queue – Deleting a Message Queue – Waiting for a Message at a Queue – Sending Message to a Queue – Flushing a Queue.

UNIT V MEMORY MANAGEMENT

Memory Control Blocks – Creating Partition- Obtaining a Memory Block – Returning a Memory Block .Getting Started with μ C/OS-II – Installing μ C/OS-II – Porting μ C/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with μ C/OS-II – μ C/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Analyze the Multichannel ADC with help of μ C/OS-II.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s)	Title of the Book	Publisher	Year of
	Name			Publication
1	Jean J. Labrosse	MicroC/OS – II The Real Time Kernel	CMP Books, II Edition	2002
2	Colin Walls,	Building a Real Time Operating System	Elsevier Science	2009

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	David Seal	ARM Architecture Reference Manual	Addison Wesley	2000
2	Steve Furbe,	ARM System-on-Chip Architecture	Pearson Education, II Edition	2001

16BEEE7E11 ADVANCES IN SOFT COMPUTING L T I

Course Objectives

- To study basics of Fuzzy logic and modeling.
- To study various Genetic algorithms
- To educate how to use Soft Computing to solve real-world problems
- To study about the perception concept in design
- To study basics of various Neural networks.
- To expose the students to Neuro fuzzy modeling and its applications.

Course Outcomes

- At the end of the course the students will gain knowledge in various soft computing techniques and also analyse the genetic algorithm approach.
- The students will know the applications of various soft computing techniques.
- Gaining knowledge about use of Soft Computing to solve real-world problems
- Acquire knowledge about the perception concept in design
- Experience in fuzzy models preparation
- Experience about automobile fuel efficiency improvements

UNIT I FUZZY LOGIC

Introduction to Neuro – Fuzzy and soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic operations – Member Function Formulation and parameterization – Fuzzy Rules and Fuzzy Reasoning - Extension principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models-Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT II GENETIC ALGORITHM

Derivative-based Optimization – Descent Methods – The Method of steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT III NEURAL NETWORKS

Introduction -Supervised Learning Neural Networks – Perceptrons - Adaline – Back propagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT IV NEUROFUZZY MODELING

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro-Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT V APPLICATIONS

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency prediction – Soft Computing for Color Recipe Prediction.

AL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s)	Title of the Book	Publisher	Year of
	Name			Publication
1	J.S.R.Jang,	Neuro-Fuzzy and Soft	PHI,	2004
	C.T.Sun and	Computing	Pearson Education	
	E.Mizutani			
2	Davis	Genetic Algorithms:Search,	Addison Wesley,	2004
3	E.Goldberg	Optimization and Machine	N.Y	-
		Learning		

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	S.Rajasekaran and G.A.V.Pai	Neural Networks, Fuzzy Logic and Genetic Algorithms	PHI, Pearson Education	2003

PROFESSIONAL ELECTIVE- VI (ONLY APPLICABLE FOR VIII SEMESTER)

16BEEE8E01FLEXIBLE AC TRANSMISSION SYSTEMSL T P C 3 0 0 3

Course Objectives

- To study the various FACTS controllers and its applications.
- To study the characteristics of ac transmission
- To study the effect of shunt and series reactive compensation.
- To study the controllers of FACTS
- To study the coordination of FACT controlling systems
- To study about the reactive compensation according to the need

Course Outcomes

- At the end of the course the student will gain knowledge about various FACTS controller and its applications.
- At the end of the course the student will gain knowledge about various FACTS controller and its applications.
- Evaluate the characteristics of ac transmission
- Reproduce the effect of shunt and series reactive compensation.
- Justify the working principles of FACTS devices and their operating characteristics
- Getting knowledge in FACTS controller and its coordination
- Real time application studied about FACTS

UNIT I INTRODUCTION TO FACTS

Reactive power control in electrical power transmission lines - series compensation -Concepts of SVC, TCSC and UPFC.

UNIT II SVC AND ITS APPLICATIONS

Objective of shunt compensation – Principle and operating characteristics of Thyristor Controlled Reactor(TCR) – Thyristor Switched Capacitor(TSC)-Voltage control by SVC – Advantages of slope in dynamic characteristics – Applications: Enhancement of transient stability – steady state power transfer – Enhancement of power system damping – prevention of voltage instability.

UNIT III TCSC AND ITS APPLICATIONS

Series compensation and it **Course Objectives**-Operation of the TCSC – Different modes of operation Application: Improvement of the system stability limit -Enhancement of system damping –Voltage collapse prevention

UNIT IV EMERGING FACTS CONTROLLERS

Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics – Unified Power Flow Controller (UPFC) – Principle of operation –Modes of Operation-Applications – Modeling of UPFC for Power Flow – Studies.

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UNIT V COORDINATION OF DIFFERENT FACTS CONTROLLERS 9

Controller interactions – SVC – SVC interaction – Co-ordination of multiple controllers using linear control techniques – Control coordination using genetic algorithms.

TOTAL: 45 HOURS

TEXT BOOKS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Mohan Mathur. R., Rajiv.K.Varma	Thyristor–Based Facts Controllers for Electrical Transmission Systems	IEEE press and John Wiley & Sons, Inc, New York	2002
2	Narain G. Hingorani, Laszio. Gyugyl	Understanding FACTS : Concepts and Technology of Flexible AC Transmission Systems	Standards publishers, New Delhi	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Narin G. Hingorani	High Power Electronics and	IEEE High Power	2002
		Flexible AC Transmission	Engineering Review	
		Systems	volume 8: issue 7	

WEBSITES

1. www.uni–due.de

2. www.chetanasprojects.com
- To study the generation of switching transients and their control using circuit theoretical concept. To study the mechanism of lightning strokes and the production of lightning surges.
- To study the propagation, reflection and refraction of travelling waves.
- To study the problem of power system stability and its impact on the system.
- To study the different power system components for the study of stability.
- To understand the methods to improve stability.
- To study the impact of voltage transients caused by faults, circuit

Course Outcomes

At the end of the course the student will be able to understand and observe the generation of switching transients and their control using circuit– theoretical concept.

- The students will be able to analyze mechanism of lighting strokes and the production of lighting surges and design the propagation, reflection and refraction
- Understand the problem of power system stability and its impact on the system.
- Analyze linear dynamical systems and use of numerical integration methods.
- Model different power system components for the study of stability. Understand the methods to improve stability.
- Understand real time difficulties in machine analysis
- To get known about modelling system and its control

UNIT-I

Concept and importance of stability in power system operation and design. Steady state, transient and dynamic stability. The swing equation of machines connected to infinite bus bar and machines connected together

UNIT -II

Swing curves-Solution by point by point and Euler's method. Qualitative treatment of stability studies on Network analyzers and digital computers..

UNIT -III

Equal area criterion, calculation of critical clearing angle by equal area criterion of various fault conditions. Effect of reclosure. Factors affecting transient stability and its improvement.

UNIT-IV

Types of excitation systems, AVR, calculation of exciter response by graphical integration and step-by-

step methods. Effect of speed governing system inertia and damping on steady state and transient stability.

UNIT-V

Significance of steady state stability, power limit of transmission systems. Clarke's diagram of two machine systems with and without losses. Steady stability of one machine connected to an infinite bus bar.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher		Year of Publication
1	K.A. Gangadhar	Analysis and stability of Electrical power system	Khanna	Publishers	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
1	E.W.Kimbark	Power System Stability	Vol-I and II, Wiley Eastern Ltd.	-
2	Olle.I.Elgerd	Electric Energy Systems Theory-An Introduction	Tata McGraw-Hill Pub.co.Ltd., New Delhi	2003
3	S.S.Vadhera	Power System Analysis and Stability	Hanna Publishers, New Delhi.	-

- To learn generation of electrical power from different types of power plants like thermal nuclear and hydro power stations.
- To understand the concepts of generation of electrical power using non conventional energy resources.
- To learn the economics connected with power generation.
- To understand the measurements of various parameter in power plant and their control.
- To study about Power plant instrumentation
- To acquire knowledge of renewable power system

Course Outcomes

- At the end of the course the student will gain knowledge about economics of power generation, layout and working of thermal, nuclear and hydropower plants.
- The student also gain knowledge about distributed generation, boiler turbine monitoring sytem.
- To get knowledge in Powerplant instrumentation
- Students acquire knowledge of renewable power system
- Acquire knowledge about economics in power generation
- Knowledge in Load demand and factor

UNIT I ECONOMICS OF GENERATION

Load and load duration curve – Load, demand and diversity factors – Plant capacity and plant use factors – choice of type of generation – choice of size and number of unit – cost of energy generated – Tariffs.

UNIT II THERMAL, NUCLEAR AND HYDRO POWER PLANTS

Location, Layout and working of steam ,diesel and gas power plants - Principles of nuclear power generation, Types of nuclear power plants and their comparison, Layout and working of nuclear power plants, Advantages and disadvantages of nuclear energy- Layout and working, Types of hydroelectric power plants, Advantages of hydro generation, Environmental issues.

UNIT III POWER PLANT INSTRUMENTATION

Importance of instrumentation in power plants, UP & I diagram of boiler- Measurements of non electrical parameters, flow of feed water, air, steam, radiation detector, smoke density measurement-analyzers, flue gas oxygen analyzer, chromatography, PH meter, pollution monitoring instruments.

UNIT IV BOILER, TURBINE-MONITORINGAND CONTROL

Combustion control - furnace draft control-drum level control- de-aerator control- boiler interlocks-speed, vibration, temperature monitoring control of turbine lubrication and cooling system of turbine.

UNITV DISTRIBUTED GENERATION AND NON CONVENTIONAL PLANTS 9

Introduction to the concept of distributed generation -basics on distributed generation

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Technologies- Effect on system operation. Basic concepts, Principle of working and layout of MHD, Solar, Wind, Tidal, Biomass and Geothermal Power Generation Systems.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Nagpal.G.R	Power plant engineering	Khanna Publishers, New Delhi	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Wadhwa, C.L	Generation, Distribution and Utilization of Electric Energy	New Age International Ltd.,3rd edition	2011
2	Nagrath.I.J,and Kothari.D.P	Modern Power System Analysis	Tata Mc Graw Hill,3rd edition	2003
3	Anne-Marie Borbely, Jan F.Kreider	Distributed Generation	CRC Press LLc	2001
4	Gupta.B.R	Generation of Electrical energy	Eurasia Publishing House(p) Ltd,New Delhi	2003

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.
- To study the fundamentals of quality controls.
- To study the concepts of total quality management.
- To study the concepts of total education

Course Outcomes

At the end of this course, students will demonstrate the ability to

- 1. Understand the principles and basic concepts.
- 2. Understand the fundamentals of quality controls.
- 3. Explain the concepts of total quality management.
- 4. Explain the concepts of total education
- 5. Diagnose problems in the quality improvement process, SPC etc.
- 6. Diagnose problems in the production planning, control and decision making.

UNIT I INTRODUCTION

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs – Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management (TQM), Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT II TQM PRINCIPLES

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Triology, PDSA Cycle, 5S Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy and Performance Measures.

UNIT III STATISTICAL PROCESS CONTROL

The seven QC tools, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT IV TQM TOOLS

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT V QUALITY SYSTEMS

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Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits. TOTAL: 45 HOURS

TEXT BOOKS

S.	Author(s) Name	Title of the Book	Publisher	Year of
No.				Publication
1	Dale H Besterfiled	Total Quality Management	Pearson Education,	2003
			Inc., New Delhi	
2	Narayana, V. and	Quality Management –	New Age	2007
	Sreenivasan, N.S	Concepts and Tasks	International, New	
			Delhi - reprint	

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	James R Evans and	The Management and Control	South-Western	2011
	William M Lidsay	of Quality	Thomson Learning,	
			United States – 8 th	
			edition	

WEBSITE

www.management.about.com

VIRTUAL INSTRUMENTATION

16BEEE8E05

Course Objectives

- To introduce concepts of Lab view software.
- To study graphical programming, interfacing instruments and its protocols.
- To introduce data acquisition methods.
- To introduce signal processing and network automation tools.
- To study about data cards in instrumentation
- To study the interface bus and signals

Course Outcomes

- At the end of the course the student will be able understand the concepts of virtual instrumentation.
- Knowledge about VI programming
- Gain experience in Standards and protocols of instrumentation
- Real time automation activity in instrumentation
- DSP based instrumentation control and its applications
- Gain Knowledge of automated control in instrumentation

UNIT I REVIEW OF DIGITAL INSTRUMENTATION

Representation of analog signals in the digital domain – Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.

UNIT II GRAPHICAL PROGRAMMING AND LABVIEW

Concepts of graphical programming – LABVIEW software – Concept of VIs and sub VI - Display types – Digital – Analog – Chart and Graphs. Loops - structures - Arrays – Clusters. Local and global variables – String and file I/O. Timers and dialog controls.

UNIT III INSTRUMENT INTERFACES AND PROTOCOLS

RS232, RS 422, RS 485 and USB standards - IEEE 488 standard – Introduction to bus protocols of MOD bus and CAN bus. Electronic standards for signals – noise and EMI effects. Signal conditioning chassis and extension modules. Image acquisition cards.

UNIT IV PC BASED DATA ACQUISITION

Concept of PC based data acquisition – Typical on board DAQ card – Resolution and sampling frequency - analog inputs and outputs – Single-ended and differential inputs –DAQ cards terminal boxes - Use of timer-counter and analog outputs on the universal DAQ card.

UNIT V SIGNAL PROCESSING AND NETWORK BASED AUTOMATION 9

Mathematical tools for statistical calculation – Signal processing tools- Windowing and filtering tools –Control system tools – PID controller – CRO – function generator –illustration and case study – Web publishing tool –configuring VI server.

TOTAL: 45 HOURS

TEXT BOOKS

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S. No.	Author(s)	Title of the Book	Publisher	Year of
	Name			Publication
1	Sanjeev Gupta	Virtual Instrumentation using LabVIEW'	ТМН	2004
2	Jovitha Jerome	Virtual Instrumentation using LabVIEW	Prentice Hall	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gary W. Johnson, Richard Jennings	Lab-view Graphical Programming	Tata McGraw Hill Professional Publishing, IV Edition	2006
2	Robert H. Bishop	Learning with Lab-view	Prentice Hall	2009
3	Kevin James	PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control	Newness	2000

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study the Euler, Lagrangian formulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the sensors of robot
- To study the control of robots for some specific applications.

Course Outcomes

Upon completion of the course, the student should be able to:

- Explain the basic concepts of working of robot •
- Analyze the function of sensors in the robot
- Write program to use a robot for a typical application
- Use Robots in different applications
- Experience in various power source availability in real time application
- Get experience in robots in manufacturing plant

UNIT I **BASIC CONCEPTS**

Definition and origin of robotics - different types of robotics - various generations of robots degrees of freedom - Asimov's laws of robotics - dynamic stabilization of robots.

UNIT II POWER SOURCES AND SENSORS

Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements - path determination - micro machines in robotics - machine vision - ranging laser – acoustic – magnetic, fiber optic and tactile sensors.

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS

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

UNIT IV **KINEMATICS AND PATH PLANNING**

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill Climbing Techniques – robot programming languages

UNIT V **CASE STUDIES**

Mutiple robots - machine interface - robots in manufacturing and non- manufacturing applicationsrobot cell design - selection of robot.

TOTAL: 45 PERIODS

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TEXT BOOKS:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	ВООК		PUBLICATION
1	Mikell P. Weiss G.M., Nagel R.N., Odraj N.G	Industrial Robotics	Mc Graw-Hill Singapore	1996
2	Ghosh	Control in Robotics and Automation: Sensor Based Integration	Allied Publishers, Chennai	1998

REFERENCES:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Deb. S.R.	Robotics Technology and flexible Automation	John Wiley, USA	1992
2	Klafter R.D, Chimielewski T.A., Negin M	Robotic Engineering – An integrated approach	Prentice Hall of India, New Delhi	1994
3	Mc Kerrow P.	Introduction to Robotics	Addison Wesley, USA	1991
4	Issac Asimov	Robot	Ballantine Books, New York	1986
5	Barry Leatham – Jones	Elements of industrial Robotics	PITMAN Publishing	1987
6	Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey	Industrial Robotics Technology, Programming and Applications	McGraw Hill Book Company	1986
7	Fu K.S. Gonzaleaz R.C. and Lee C.S.G	Robotics Control Sensing, Vision and Intelligence	McGraw Hill International Editions	1987

LIST OF OPEN ELECTIVES

LIST OF OPEN ELECTIVES OFFERED BY OTHER DEPARTMENTS

SCIENCE AND HUMANITIES

16BESHOE01PROBABILITY AND RANDOM PROCESSL T P C 3 0 0 3

Course Objectives

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.
- To study statistical methods of the sample data.

Course Outcomes

- 1. Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
- 2. The students will have an exposure of various distribution functions, correlation and spectral densities.
- 3. To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- 4. To understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- 5. To apply the concept random processes in engineering disciplines.
- 6. To understand and apply the concept of correlation and spectral densities

UNIT- I MEASURES OF CENTRAL TENDENCY AND PROBABILITY 9

Measures of central tendency – Mean, Median, Mode - Standard Deviation Probability - Random variable - Axioms of probability - Conditional probability - Total probability – Baye's theorem.

UNIT- II STANDARD DISTRIBUTIONS

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – Chebyshev's inequality.

UNIT -III TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions - Covariance - Correlation and regression

UNIT- IV CLASSIFICATION OF RANDOM PROCESS

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT -V CORRELATION AND SPECTRAL DENSITIES

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TOTAL : 45 HOURS

TEXT BOOK

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Peebles Jr, P.Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Publishers, New Delhi.	2002

REFERENCES

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Ross, S	A first Course in	Pearson Education,	2012
		Probability	New Delhi (Chap 2 to 8)	
2	Gupta, S.C. and	Fundamentals of	Sultan Chand and Sons,	2014
	Kapoor, V.K	Mathematical	New Delhi.	
		Statistics		

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3	Veerarajan,T.	Probability, Statistics and Random process	Tata McGraw-Hill Education pvt. Ltd., New Delhi	2008
4	Henry Stark and John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002

WEBSITES

- 1. <u>www.cut-theknot.org/probability.shtml</u>
- 2. www.mathcentre.ac.uk
- 3. <u>www.mathworld</u>. Wolfram.com

- Be able to understand basic knowledge of fuzzy sets and fuzzy logic •
- Be able to apply basic knowledge of fuzzy operations. •
- To know the basic definitions of fuzzy relations •
- Be able to apply basic fuzzy inference and approximate reasoning •
- To know the applications of fuzzy Technology. •
- To study and acquire the knowledge to comprehend the concepts of fuzzy relations •

Course Outcomes

- To gain the main subject of fuzzy sets.
- To understand the concept of fuzziness involved in various systems and fuzzy set theory. •
- To gain the methods of fuzzy logic.
- To comprehend the concepts of fuzzy relations.
- To analyze the application of fuzzy logic control to real time systems.
- The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNIT I **FUZZY SETS**

Fuzzy Sets : Basics Classical sets vs Fuzzy Sets - Need for fuzzy sets - Definition and Mathematical representations - Level Sets - Fuzzy functions - Zadeh's Extension Principle

UNIT II **OPERATIONS ON FUZZY SETS**

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III **FUZZY RELATIONS**

Fuzzy Relations Fuzzy Binary and n-ary relations - composition of fuzzy relations - Fuzzy Equivalence Relations - Fuzzy Compatibility Relations - Fuzzy Relational Equations

UNIT IV FUZZY MEASURES

Possibility Theory Fuzzy Measures - Evidence Theory - Necessity and Belief Measures - Probability Measures vs Possibility Measures

UNIT V **FUZZY INFERENCE**

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference - Compositional rule of Inference - Efficiency of Inference - Hierarchical

TOTAL: 45 HOURS

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TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic : Theory and Applications	Prentice Hall of India, New Delhi.	2003

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Zimmermann H.J.	Fuzzy Set Theory and its Applications	Kluwer Academic publishers, USA.	2001
2	Michal Baczynski and Balasubramaniam Jayaram	Fuzzy Implications	Springer-Verlag publishers, Heidelberg	2008
3	Kevin M Passino and Stephen Yurkovich	Fuzzy Control	Addison Wesley Longman publishers, USA	1998

WEBSITES

- 1. <u>www.mathcentre.ac.uk</u>
- 2. <u>www.mathworld</u>. Wolfram.com
- 3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

- To introduce the basic concepts of vector space
- To know the fundamentals of linear Algebra
- To solve system of linear equations
- To study about the linear transformations
- To introduce the concepts of inner product spaces

Course Outcomes

student will be able to

- To explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- To describe the fundamental concepts of Eigen values and Eigen vectors by using Power method.
- To apply the fundamental concepts in their respective engineering fields
- To visualize linear transformations as matrix form
- To recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
- To articulate the importance of Linear Algebra and its applications in branches of
 Methometics

UNIT I VECTOR SPACES

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II EIGEN VALUES AND EIGEN VECTORS

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNIT III SYSTEM OF LINEAR EQUATIONS

Direct methods, Gauss elimination method, Gauss Jordan method, Crout's method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNIT IV LINEAR TRANSFORMATIONS

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigen values and Eigenvectors Eigen values and Eigenvectors – Diagonalization

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UNIT V INNER PRODUCT SPACES

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

TEXT BOOKS

PUBLISHER TITLE OF THE S. AUTHOR(S) YEAR OF NO. NAME BOOK **PUBLICATION** Kreyszig,E John Wiley & Sons, New 1 Advanced 2014 Delhi. Engineering Mathematics Publications, 2 Shahnaz Bathul Text PHI 2009 book of New Delhi. Engineering Mathematics(Special Functions and Complex Variables)

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES

- 1. www.sosmath.com
- 2. www.nptel.ac.in
- 3. www.mathworld.wolfram.com

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TOTAL : 45 HOURS

- To disseminate the fundamentals of acoustic waves. (K)
- To inculcate the characteristics of radiation and reception of acoustic waves. (K)
- To divulge knowledge on the basics of pipe resonators and filters.(S)
- To introduce the features of architectural acoustics
- To impart the basic knowledge of transducers and receivers.(K)
- To study about the pipes resonant and filters

Course Outcomes

- Develop the idea of the fundamentals of acoustic waves.
- Apply the concepts of radiation and reception of acoustic waves.
- Explain the basic ideas of pipe resonators and filters.
- Illustrate the basics of architectural acoustics..
- Illustrate the transducers and receivers and its applications in various electronic devices.
- Apply the knowledge inputs of the course for engineering applications.

UNIT I INTRODUCTION

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves - Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales. Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence – method of images.

UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance -Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORS AND FILTERS

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

UNIT IV ARCHITECTURAL ACOUSTICS

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design. Environmental Acoustics: Highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

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UNIT V TRANSDUCTION

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

TOTAL : 45 HOURS

TEXT BOOK

S.NO	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
	NAME	BOOK		PUBLICATION
1	Lawerence E.Kinsler,	Fundamentals of Acoustics	John Wiley & Sons	2000
	Austin R.Frey,			

REFERENCE

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	<u>F.</u> <u>AltonEverest</u> &	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEBSITES

- 1. www.acousticalsociety.org
- 2. www.acoustics-engineering.com
- 3. www.nptel.ac.in
- 4. www. ocw.mit.edu

- To make the students conversant with basics of Solid wastes and its classification.
- To make the student acquire sound knowledge of different treatments of solid wastes.
- To acquaint the student with concepts of waste disposals.
- To develop an understanding of the basic concepts of Hazardous waste managements.
- To acquaint the students with the basics of energy generation from waste materials.
- To understand about the solid waste and to get the information on energy conservation.

Course Outcomes:

- Outline the basic principles of Solid waste and separation of wastes (K)
- Identify the concepts of treatment of solid wastes (S)
- Identify the methods of wastes disposals. (S)
- Examine the level of Hazardousness and its management. (S)
- Examine the possible of the energy production using waste materials. (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I SOLID WASTE

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNIT II WASTE TREATMENT

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT III WASTE DISPOSAL

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classification, Types, Methods & Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfill Remediation

UNIT IV HAZARDOUS WASTE MANAGEMENT

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure,

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Remediation, risk assessment.

UNIT V ENERGY GENERATION FROM WASTE

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, Energy recovery systems. Biological & Chemical conversion technologies – Aerobic composting, low solids. Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes. Chemical transformation processes.

TOTAL : 45 HOURS

S. AUTHOR(**TITLE OF THE BOOK PUBLISHER** YEAR OF Ν **PUBLICATIO** S) 0. NAME Ν Dara.S.S,Mishra.D. A Text book of Environmental S.Chand and 20 1. D 11 Chemistry and Pollution Company Ltd., New Delhi. Control

REFERENCE BOOKS

TEXT BOOK

S N O.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO N
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series in Energy)	Woodhead Publishing Ltd., Cambridge, UK	20 13
2.	Frank Kreith, George Tchobanoglous	Hand Book of Solid Waste Management- 2 nd edition	McGraw Hill Publishing Ltd., Newyork	20 02
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	19 99

WEBSITES

1. www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.

2.<u>http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/</u>

3. www.alternative-energy-news.info/technology/garbage-energy/

4. nzic.org.nz/ChemProcesses/environment/

- 1. To make the students conversant about the green chemistry
- 2. To make the student acquire sound knowledge of the atom efficient process and synthesis elaborately.
- 3. To acquaint the student with concepts of green technology.
- 4. To develop an understanding of the basic concepts of renewable energy resources.
- 5. To acquaint the students with the basic's information on catalysis.
- 6. To gain knowledge on the green technology and renewable energy resources

Course Outcomes

- Outline the basic principles of green chemistry (K)
- Examine the different atom efficient process and synthesis elaborately (S)
- Apply the concepts combustion of green technology (S)
- Identify and apply the concepts of renewable energy (S)
- Apply the concepts of green catalysts in the synthesis (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO GREEN CHEMICAL PRINCIPLES

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNIT II ATOM EFFICIENT PROCESSES

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

UNIT III BIOTECHNOLOGY AND GREEN CHEMISTRY

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNIT IV RENEWABLE RESOURCES

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from

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glucose and biomass conversion.

UNIT V CATALYSIS IN GREEN CHEMISTRY

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

TEXT BOOKS

S • N O.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO N
1.	Sanjay K. Sharma, Ackmez Mudhoo	Green Chemistry for Environmental Sustainability	CRC Press, London	20 10
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2 nd edition	Anamaya publishers., New Delhi.	20 07

REFERENCE BOOKS

S	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
•		BOOK		PUBLICATIO
N				N
0.				
1.	Dr. Sunita Ratan	A Textbook of	S.K. Kataria and Sons.,	20
		Engineering	New Delhi.	12
		Chemistry		
2.	Mukesh Doble.	Green Chemistry and	Academic Press,	20
	Ken Rollins, Anil	Engineering, 1 st	Elesevier., New	07
	Kumar	edition	Delhi.	
3.	Desai K. R.	Green Chemistry	Himalaya	20
			Publishing House,	05
			Mumbai.	
4.	Matlack A. S.	Introduction to Green	Marcel Dekker: New	20
		Chemistry	York	01

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TOTAL : 45 HOURS

WEBSITES

- 1. http://www.organic-chemistry.org/topics/green-chemistry.shtm
- 2.<u>http://www.essentialchemicalindustry.org/processes/green-chemistry.html</u>
- 3. <u>http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm</u>
- 4. <u>http://www.epa.gov/research/greenchemistry/</u>
- 5. http://www.amazon.in/Green-Chemistry-Catalysis

16BESHOE07

Course Objectives

- To get the information on electrochemical material.
- To study about the conducting polymers.
- To acquaint the student with concepts of Energy storage devices.
- To gain knowledge on the batteries and power sources.
- To develop energy storage devices.
- To study and identify the concepts of storage devices and its applications. (S)

Course Outcomes

- 1. Outline the basic principles of chemistry in electrochemical material (K).
- 2. Examine the properties of conducting polymers (S).
- 3. Apply the concepts of electrochemistry in storage devices. (S)
- 4. Identify the concepts of storage devices and its applications. (S)
- 5. Apply the suitable materials for the manufacturing of storage devices. (S)
- 6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I METAL FINISHING

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electroplating for electronic industry- Alloy plating, brass plating- Electro less plating of nickel- anodizing - Electroforming - Electro winning.

UNIT II CONDUCTING POLYMERS AND ELECTROCHEMICALS

Electro polymerisation- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III BATTERIES AND POWER SOURCES-I

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV BATTERIES AND POWER SOURCES-II

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteriesconstruction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

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UNIT V ELECTROCHEMICAL MATERIAL SCIENCE

Solar cells- Preparation of CdS/Cu₂S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

TOTAL : 45 HOURS

TEXT BOOKS

S. N O.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO N
1.	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier., UK	2007
2.	D.Pletcher and F.C.Walsh	Industrial Electrochemistry	Chapman and Hall, London	1990

REFERENCE BOOKS

S · N O.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO N
1.	M. Barak	Electrochemical Power Sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
2.	Bruno Scrosati	Applications of Electroactive Polymers	Chapman & Hall, London	1993
3.	K.L. Chopra and I. Kaur	Thin Film Devices and their Application	Plenum Press, New York.	1983
4.	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New York	1983

WEBSITES

- 1. http://www.anoplate.com/finishes/
- 2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
- 3. http://inventors.about.com/od/sstartinventions/a/solar_cell.htm

- To make the students conversant with **cement and lime** and its uses.
- To make the student acquire sound knowledge of abrasives and refractories.
- To acquaint the student with concepts of inorganic chemicals.
- To develop an understanding of the basic concepts explosives.
- To acquaint the students with the basics of **agriculture chemicals**.
- To study the concepts of explosives and smoke screens(S)

Course Outcomes

- Outline the basic chemistry of cement and lime (K)
- Examine the uses of abrasives and refractories (S)
- Identify the usage of the inorganic chemicals. (S)
- Identify the concepts of explosives and smoke screens (S)
- Identify the usage of the **agriculture** chemicals (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I CEMENT AND LIME

Manufacture of Portland cement – settling of hardening of portland cement – regauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – magnesium lime – dolomitic lime – hydraulic lime.

UNIT II ABRASIVES AND REFRACTORIES

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNIT III INORGANIC CHEMICALS

Common salt and soda ash – manufacture – different grades – products – alkalis – Na_2CO_3 , caustic soda and chlor-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture – absorption – uses, sulphur and sulphuric acid – extraction of sulphur – manufacture of H_2SO_4 – chamber – contact processes – industrial uses.

UNIT IV EXPLOSIVES

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gas mask.

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UNIT V AGRICULTURE CHEMICALS

TOTAL : 45 HOURS

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TEXT BOOKS

S.	AUTHOR(TITLE OF THE BOOK	PUBLISHER	YEAR OF
0.	S) NAME			N
1.	Harikrishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCE BOOKS

S •	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO
N O.				Ν
1.	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH	19
			Delhi.	20
2.	James A. Kent	Hand Book of Industrial	Van Nostrand Reinhold,	19
		Chemistry, 9 th edition	New York.	92
3.	R.N. Sherve	Chemical Process	McGraw-Hill,	19
		Industries	Kugakuisha Ltd., Tokyo.	84
4.	S.D. Shukla and	A Text book of Chemical	Vikas Publishing	19
	G.N. Pandy	Technology		79
			House (P) Ltd, New	
			Delhi.	

WEBSITES

- 1. http://en.wikipedia.org/wiki/Cement
- 2. http://www.hon.ch/HONselect/Selection/D01.html
- 3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm

4. http://toxics.usgs.gov/topics/agchemicals.html

COMPUTER SCIENCE ENGINEERING

16BECSOE01

INTERNET PROGRAMMING

L T P C 3 0 0 3

Course Objectives

- To study concepts of Internet, IP addresses and protocols
- To explain the concept of web page development through HTML
- To introduce the PERL and explore its current strengths and Weaknesses
- To write working Java code to demonstrate the use of applets for client-side programming
- To study Internet telephony and various multimedia applications
- To Elaborate on the principles of web page development

Course Outcomes

Upon completion of this course, the student will be able to:

- Learn the advanced concepts& techniques of Internet and Java.
- Analyze the requirements for and create and implement the principles of web page development
- Understand the concepts of PERL
- Implement client-side programming using java applets
- Generate internet telephony based upon advanced concepts
- Develop applications on internet programming based on java applets and scripts

UNIT I INTRODUCTION

Introduction - Network of Networks, Intranet, Extranet and Internet. World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing- Classful and Classless Addressing, Subnetting

UNIT II HTML

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts- Introduction- Environment Variable, GET and POST Methods.

UNIT III PERL

Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java Applets-Container Class, Components, Applet Life Cycle, Update method, Applications.

UNIT IV CLIENT-SERVER PROGRAMMING

Client-Server programming In Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security

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techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Proxy.

UNIT V INTERNET TELEPHONY

Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP-Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

TOTAL: 45 HOURS

S. NO. AUTHOR(S) **TITLE OF THE BOOK** PUBLISHER YEAR OF NAME **PUBLICATION** Internet and World Wide 5th Edition 1 Paul Deitel, 2011 Harvey Deitel Web-How to Program and Abby Deitel PHI Learning, Delhi N.P. Gopalan Web Technology: A 2 2013 and J. Developer's Perspective Akilandeswari

REFERENCES

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Rahul Banerjee	Internetworking Technologies, An Engineering Perspective	PHI Learning, Delhi	2011
2	Robert W. Sebesta	Programming the World Wide Web	Pearson Education	2016

- To impart the fundamental concepts of Computer Animation and Multimedia
- To study the graphic techniques and algorithms using flash
- Explain various concepts available in 3D animation
- Explain various devices available for animation
- To study the multimedia concepts and various I/O technologies for concept development
- To understand the three-dimensional graphics and their transformations

Course Outcomes

Upon completion of this course, the student will be able to:

- Develop their creativity using animation and multimedia
- Understand the concepts of Flash and able to develop animation using it
- Understand about various latest interactive 3D animation concepts
- Know the various devices and software available in motion capture
- Understand the concept development process
- Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.

UNIT I INTRODUCTION

What is mean by Animation – Why we need Animation – History of Animation – Uses of Animation – Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects - Creating Animation.

UNIT II CREATING ANIMATION IN FLASH

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Framebased Animation - Working with the Timeline and Tween-based Animation – Understanding Layers - Action script.

UNIT III 3D ANIMATION & ITS CONCEPTS

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

UNIT IV MOTION CAPTION

Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

UNIT V Concept Development

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

TOTAL: 45 HOURS

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TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Malay K. Pakhira	Computer Graphics, Multimedia and Animation	PHI Learning PVT Ltd	2010

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ranjan Parekh	Principles of Multimedia	TMH	2007
2	Ashok Banerji, Ananda Mohan Ghosh	Multimedia Technologies	McGraw Hill Publication	
3	Pankaj Dhaka	Encyclopedia of Multimedia and Animations	Anmol Publications	2011

16BECSOE03 PC HARDWARE AND TROUBLE SHOOTING LTPC3003

Course Objectives

- To study the basic parts of computer in detail
- Introduce various peripheral devices available for computer and its detailed working • concepts
- Overview of various interfaces and other hardware overview •
- Assemble/setup and upgrade personal computer systems and discuss about power supplies • and the skills to trouble-shoot various power-related problems.
- To study basic concepts and methods in troubleshooting •
- To study the installation/connection and maintenance of computer and its associated ٠ peripherals.

Course Outcomes

Upon completion of this course, the student will be able to:

- Identify the main components for the PC, familiarize themselves with PC memories such as RAM and • ROM devices and so on.
- Identify various peripheral devices available and its working
- Understand various concepts of hardware and its interface and control
- Perform basic installation of PC. Importance of maintenance is understood •
- Understand Various faults and failures are identified and troubleshooting in detail
- Understand overall PC hardware, interfacing, maintenance and troubleshooting •

UNIT I **INTRODUCTION**

Introduction - Computer Organization - Number Systems and Codes - Memory - ALU - CU -Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques - Microprocessor - Personal Computer Concepts - Advanced System Concepts - Microcomputer Concepts - OS - Multitasking and Multiprogramming - Virtual Memory - Cache Memory - Modern PC and User.

UNIT II PERIPHERAL DEVICES

Introduction - Keyboard - CRT Display Monitor - Printer - Magnetic Storage Devices - FDD -HDD - Special Types of Disk Drives - Mouse and Trackball - Modem - Fax-Modem - CD ROM Drive - Scanner - Digital Camera - DVD - Special Peripherals.

UNIT III PC HARDWARE OVERVIEW

Introduction - Hardware BIOS DOS Interaction - The PC family - PC hardware - Inside the System Box - Motherboard Logic - Memory Space - Peripheral Interfaces and Controllers - Keyboard Interface – CRT Display interface – FDC – HDC.

UNIT IV INSTALLATION AND PREVENTIVE MAINTENANCE

Introduction – system configuration – pre installation planning – Installation practice – routine checks

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- PC Assembling and integration - BIOS setup - Engineering versions and compatibility preventive maintenance - DOS - Virus - Data Recovery.

UNIT V Troubleshooting

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware - Programmable LSI's - Bus Faults - Faults Elimination process -Systematic Troubleshooting - Symptoms observation and analysis - fault diagnosis - fault rectification - Troubleshooting levels - FDD, HDD, CD ROM Problems.

TEXT BOOK

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peter Abel, Niyaz Nizamuddin	IMB PC Assembly Language and Programming	Pearson Education	2007
2	Scott Mueller	Repairing PC's	PHI	1992

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	B. Govindarajalu	IBM PC Clones Hardware, Troubleshooting and Maintenance	2/E, TMH	2002

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TOTAL: 45 HOURS
16BECSOE04

Course Objectives

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads, generics classes and swings
- To explain the need for generic programming
- To design and build simple Graphical User Interfaces

Course Outcomes

- Develop Java programs using OOP principles
- Develop Java programs with the concepts of inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes and swings
- Understand various aspects for motivation of generic programming
- Develop various interactive Java programs using OOP concepts of Java

UNIT I INTRODUCTION TO JAVA

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members –constructors – finalize method

UNIT II PACKAGES

Arrays – Strings - Packages – Java-Doc comments – Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

UNIT III I/O STREAMS

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

UNIT IV EXCEPTION HANDLING

Exceptions - Syntax of exception handling code - Multiple catch statements - Using finally statements

- Throwing our own exceptions - Using exceptions for debugging

UNIT V THREADS

Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

TOTAL: 45 HOURS

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TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Cay S.	Core Java: Volume I –	Sun Microsystems Press	2008
	Horstmann and	Fundamentals		
	Gary Cornell			

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	K. Arnold and J. Gosling	The JAVA programming language	Third edition, Pearson Education	2009
2	Timothy Budd	Understanding Object- oriented programming with Java Updated Edition	Pearson Education	2002
3	C. Thomas Wu	An introduction to Object-oriented programming with Java Fourth Edition	Tata McGraw-Hill Publishing company Ltd	2008

WEBSITES

- http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/
 http://www.winprog.org/tutorial/msvc.html
- 3. http://www.tutorialized.com/tutorials/Visual-C/1
- 4. http://www.freeprogrammingresources.com/visualcpp.html

ELECTRONICS AND COMMUNICATION ENGINEERING

16BEECOE01	REAL TIME EMBEDDED SYSTEMS	L T P C 3 0 0 3
Course Objectives		

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management
- To imparts knowledge on

Course Outcomes

At the end of the course the students will be able to

- Understand overview of embedded systems architecture
- Acquire knowledge on embedded system, its hardware and software.
- Gain knowledge on overview of Operating system
- Discuss about task Management
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management.

UNIT - I INTRODUCTION TO EMBEDDED SYSTEM

Introduction - Embedded systems description, definition, design considerations & requirements -Overview of Embedded system Architecture (CISC and RISC) - Categories of Embedded Systems embedded processor selection &tradeoffs - Embedded design life cycle - Product specifications hardware/software partitioning - iterations and implementation - hardware software integration product testing techniques – ARM 7

UNIT - II OPERATING SYSTEM OVERVIEW

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-preemptive Kernels - Preemptive Kernels – Reentrancy- Reentrant Functions – Round Robin Scheduling - Task Priorities - Static Priorities – Mutual Exclusion – Deadlock – Intertask Communication – Message Mailboxes – Message Queues - Interrupts - Task Management – Memory Management - Time Management – Clock Ticks.

UNIT - III TASK MANAGEMENT

Introduction - μ C/OS-II Features - Goals of μ C/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under μ C/OS-II – Clock Tick - μ C/OS-II Initialization. Task Management: Creating Tasks – Task Stacks – Stack Checking – Task's Priority – Suspending Task – Resuming Task. Time Management: Delaying a Task – Resuming a Delayed Task – System Time. Event Control Blocks- Placing a Task in the ECB Wait List – Removing a Task from an ECB waits List.

UNIT - IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING

Semaphore Management: Semaphore Management Overview – Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox – Waiting for a Message box – Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue – Deleting a Message Queue – Waiting for a Message at a Queue – Sending Message to a Queue –

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UNIT - V MEMORY MANAGEMENT

Memory Management: Memory Control Blocks – Creating Partition- Obtaining a Memory Block – Returning a Memory Block .Getting Started with μ C/OS-II – Installing μ C/OS-II – Porting μ C/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with μ C/OS-II - μ C/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Analyze the Multichannel ADC with help of μ C/OS-II.

TOTAL: 45 HOURS

S.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
NO		BOOK		PUBLICATION
				• • • • •
1	Jean J. Labrosse	MicroC/OS – II The	CMP BOOKS	2009
		Real Time Kernel		
2	David Seal	ARM Architecture	Addison-Wesley	2008
		Reference Manual		
3	Steve Furbe	ARM System-on-	Addison-Wesley	2000
		Chip, Architecture	Professional California	

REFERENCES

Course Objectives

- To study about various speakers and microphone
- To learn the fundamental of television systems and standards
- To learn the process of audio recording and reproduction
- To study various telephone networks
- To discuss about the working of home appliances
- To familiarize with TV services like ISDN.

Course Outcomes

- Understand working of various type of loud speakers
- Acquire knowledge on various types of picture tubes
- Demonstrate the working of various optical recording systems
- Distinguish various standards for color TV system
- Acquire knowledge on various telecommunication networks
- Demonstrate the working of various home appliances

UNIT I LOUDSPEAKERS AND MICROPHONES

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNIT – II TELEVISION STANDARDS AND SYSTEMS

Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control.

UNIT – III OPTICAL RECORDING AND REPRODUCTION

Audio Disc – Processing of the Audio signal –read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems.

UNIT - IV TELECOMMUNICATION SYSTEMS

Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

UNIT – V HOME APPLIANCES

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

TOTAL: 45 HOURS

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TEXT BOOK

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	S.P.Bali	Consumer Electronics	Pearson Education	2005

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the digital world
- To provide knowledge of computation and dynamical systems using neural networks

Course Outcomes:

At the end of the course the students will be able to

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts
- Ability to develop the use of Soft Computing to solve real-world problems

UNIT I INTRODUCTION TO NEURAL NETWORKS

Introduction - biological neurons and their artificial models - learning, adaptation and neural network's learning rules - types of neural networks- single layer, multiple layer- feed forward, feedback networks

UNIT II LEARNING PROCESS

Error - correction learning - memory based learning - hebbian learning-competitive learning-Boltzmann learning- supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCE PTION

Single layer perception-Adaptive filtering-unconstrained optimization-Least-mean square algorithm-Leaning curve-Annealing Technique-perception convergence theorem-Relationship between perception and Baye's classifier-Back propagation algorithm

UNIT IV ATTRACTOR NEURAL NETWORK AND ART

Hopfield model-BAM model- BAM stability-Adaptive BAM -Lyapunov function-effect of gain-Hopfield design-Application to TSP problem-ART- layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP

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Self organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical vector Quantization. Applications of self-organizing maps: The Neural Phonetic Typewriter Learning Ballistic Arm Movements

TOTAL: 45 HOURS

TEXT BOOKS

S.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
NO		BOOK		PUBLICATION
1	Simon Haykin	Neural Networks and Learning Machines	3/E - Pearson/ Prentice Hall	2009
2	Satish Kumar	Neural Networks : A Classroom Approach	ТМН	2008
3	Freeman J.A., Skapura D.M.	Neural networks, algorithms, applications, and programming techniques	Addition Wesley	2005
4	Laurene Fausett	Fundamentals of Neural Networks: Architectures, Algorithms, and Applications	Pearson/ Prentice Hall	
5	Robert J Schalkoff	Artificial Neural Networks	McGraw Hill	1997

16BEECOE04 FUZZY LOGIC AND ITS APPLICATIONS L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.
- Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- To learn about applications on Fuzzy based systems
- To familiarize with fuzzy fiction and de fuzzy fiction procedures

Course Outcomes:

At the end of the course the students will be able to

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Gain knowledge on theory of Reasoning
- Develop fuzzy controllers
- Understand concepts of adaptive fuzzy control
- Ability to develop how to use Fuzzy computation to solve real- world problems
- Design fuzzy based model for any application

UNIT – I

Basics Of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT – II

Theory Of Approximate Reasoning: Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference-fuzzy models

UNIT – III

Fuzz y Knowledge Based Controllers (Fkbc): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures – Design of Fuzz y Logic Controller

$\mathbf{UNIT} - \mathbf{IV}$

Adaptive Fuzz y Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNIT V FUZZY BASED SYSTEMS

Simple applications of FKBC -washing machines- traffic regulations -lift control-fuzz y in medical applications-Introduction to ANFIS.

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TEXT BOOKS

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	D. Diankar, H. Hellendoom and M. Reinfrank	An Introduction to Fuzz y Control	Narosa Publishers India	1996
2	G. J. Klir and T. A. Folger	Fuzzy Sets Uncertainty and Information	PHI IEEE	1995

BIO TECHNOLOGY

16BTBTOE01

BIOREACTOR DESIGN

L T P C 3 0 0 3

Course Objectives

- To impart basic knowledge in bioprocess Engineering
- To design the bioreactors for various operations.
- To understand the principle and working of heat transfer equipments.
- To extend the knowledge in principle of heat transfer inside a bioreactor
- To construct the equipments used in mass transfer operations.
- To learn the equipments used in separation process.

Course Outcomes

- Summarize the basic concepts in bioprocess Engineering.
- Ability to design the bioreactors for various operations.
- Ability to develop the heat transfer equipments for Bioprocess Engineering.
- Ability to construct the equipments used in mass transfer operations.
- To acquire the knowledge of regulatory constraints in bioprocess
- Categorize the equipments used in separation process

UNIT I ENGINEERING PROPERTIES AND STORAGE TANK

Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNIT II REACTOR DESIGN

Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNIT III HEAT TRANSFER EQUIPMENTS

Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNIT IV MASS TRANSFER EQUIPMENTS

Design of Bollmann extractor, fractionating column, packed tower and spray tray absorber

UNIT V SEPARATION EQUIPMENTS

Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotart drum drier and Swenson –walker crystallizer.

TOTAL: 45 HOURS

TEXT BOOKS

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHE	YEAR
				OF
				PURI ICATI
1	James Edwin Bailey,	Biochemical	McGraw-	2007
	David F. Ollis	Engineering	Hill	
		Fundamentals		

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2	Don W. Green, Robert H.	Chemical	Engineer	The	2008
	Perry	Hand book	C	McGraw- Hill	
				Companies,	

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Pauline. M. Doran	Bioprocess Engineering Principles	Academic Press	2013

FOOD PROCESSING AND PRESERVATION LTPC3003 **16BTBTOE02**

Course Objectives

- To understand the importance of food processing
- To impart basic knowledge in different food processing methods carried out in the food tech companies.
- To extend the brief knowledge in food conservation operations.
- To study the methods of food preservation by cooling.
- To familiarize the students on the concepts of preservation methods for fruits.
- To create deeper understanding on preservation methods for vegetables.

Course Outcomes

- Describe the scope and importance of food processing.
- Outline the various processing methods for foods. •
- Extend the knowledge in food conservation operations. •
- Describe the methods of food preservation by cooling. •
- Summarize the preservation methods for fruits.
- Demonstrate the preservation methods for vegetables. •

UNIT I SCOPE AND IMPORTANCE OF FOOD PROCESSING

Properties of food- Physical, thermal. mechanical, sensory. Raw material Preparation - Cleaning, sorting, grading, peeling.

UNIT II PROCESSING METHODS

Heating-Blanching and Pasteurization. Freezing-Dehydrationcanningadditives- fermentation- extrusion cooking- hydrostatic pressure cookingdielectric heating- micro wave processing and aseptic processing – Infra red radiation processing-Concepts and equipment used.

UNIT III FOOD CONVERSION OPERATIONS

Size reduction- Fibrous foods, dry foods and liquid foods-Theory and equipments- membrane separation- filtration- equipment and application.

UNIT IV FOOD PRESERVATION BY COOLING

Refrigeration, Freezing-Theory, freezing time calculation, methods freezing, of freezing equipments, freeze drying, freeze concentration, thawing, effect low of temperature on food. Water activity, methods to control water activity.

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UNIT V PRESERVATION METHODS FOR FRUITS AND VEGETABLES 9

Pre processing operations - preservation by reduction of water content: drying / dehydration and concentration – chemical preservation – preservation of vegetables by acidification, preservation with sugar - Heat preservation– Food irradiation- Combined preservation techniques.

TOTAL: 45 HOURS

TEXT BOOKS

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLIS HER	YEAR OF PUBLICATIONS
1	R. Paul Singh, Dennis R.Heldman	Introduction to food engineering.	Academic Press	2001
2	P.Fellows.	Food Processing Technology, Principles and practice.	Wood head Publishing Ltd	2000
3	Mircea Enachescu Dauthy	Fruit and Vegetable Processing	FAO agricultural services bulletin	1995

REFERENCES

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLI SHER	YEAR OF PUBLICATIONS
1	M.A. Rao, Syed S.H. Rizvi, Ashim K. Datta	Engineering properties of foods	CRC Press	2005
2	B. Sivasankar	Food processing and preservation	PHI Learning Pvt. Ltd	2002

16BTBTOE03

Course Objectives

- To enable the students to get aware of available tools and databases for performing research in bioinformatics.
- To provide the thorough understanding of protein structure in detail.
- To construct the phylogenetic trees for evolution.
- To get familiar with the 3D structure of protein and classification.
- To acquire basic knowledge in protein secondary structure prediction.
- To extend the brief knowledge in Micro array data analysis.

Course Outcomes

- Summarize the basic concepts and importance of Bioinformatics in various sectors.
- Demonstrate the sequence alignment tool in bioinformatics.
- Construct the phylogenetic trees for evolution.
- Analyze the three dimensional protein structure and classification using various tools.
- Illustrate the protein secondary structure prediction by comparative modeling.
- Extend the knowledge in micro array technology and applications of bioinformatics in various sectors.

UNIT I OVERVIEW OF BIOINFORMATICS

The scope of bioinformatics; bioinformatics & the internet; useful bioinformatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases – contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

UNIT II RETRIEVAL OF BIOLOGICAL DATA

Data retrieval with Entrez & DBGET/ LinkDB; data retrieval with SRS (sequence retrieval system).Searching sequence databases by sequence similarity criteria: sequence similarity searches; amino acid substitution matrices; database searches, FASTA & BLAST; sequence filters; iterative database searches & PSI-BLAST. Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domain families.

UNIT III PHYLOGENETICS

Phylogenetics, cladistics & ontology; building phylogenetic trees; evolution of macromolecular sequences. Sequence annotation: principles of genome annotation; annotation tools & resources.

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UNIT IV STRUCTURAL BIOINFORMATICS

Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure: CATH & SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction & prediction strategies.

UNIT V MICROARRAY DATA ANALYSIS

Microarray data, analysis methods; microarray data, tools & resources; sequence sampling & SAGE. Bioinformatics in pharmaceutical industry: informatics & drug discovery; pharma informatics resources. Basic principles of computing in bioinformatics: running computer software; computer operating systems; software downloading & installation; database management.

TEXTBOOK

S. NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER	YEAR OF
	(S) NAME			PUBLICATION
1	Dan E.	Fundamental Concepts of	Pearson education	2004
	Krane, Micha	Bioinformatics		
	L. Rayme			
2	Andreas D.	Bioinformatics: A Practical	Wiley-Interscience	2004
	Baxevanis, B.	Guide to the Analysis of Genes		
	F. Francis	and Proteins		
	Ouellette			
3	David W.	Sequence and Genome Analysis	Cold Spring Harbor	2004
	Mount	-	Laboratory	
4	Jonathan	Bioinformatics and Functional	Wiley-Liss	2003
	Pevsner	Genomics		

REFERENCE BOOKS

S. NO.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Michael J.	Microarray Data Analysis:	Springer Science &	2007
	Korenberg	Methods and Applications	Business Media	

TOTAL: 45 HOURS

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16BTBTOE04 FUNDAMENTALS OF NANOBIOTECHNOLOGY L T P C 3 0 0 3

Course Objectives

- To develop skills of the students in the field of nano biotechnology and its applications in various fields.
- The course will serve as an effective course to understand Socio-economic issues of nano biotechnology.
- To extend the knowledge in types and application of nano particles in sensors.
- To define the concepts of biomaterials through molecular self assembly.
- To equip students with clinical applications of nano devices.
- To describe deeper understanding of the socio-economic issues in nanobiotechnology

Course Outcomes

- Develop skills in the field of nano biotechnology and its applications.
- Summarize the nanoparticles and its significance in various fields.
- Extend the knowledge in types and application of nano particles in sensors.
- Define the concepts of biomaterials through molecular self assembly.
- Outline the clinical applications of nano devices.
- Describe the socio-economic issues in nanobiotechnology.

UNIT I INTRODUCTION

Introduction, Scope and Overview, Length scales, Importance of Nanoscale and Technology, History of Nanotechnology, Future of Nanotechnology: Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concept, Controversies and confusions, Understanding advanced capabilities, Nanotechnology in Different, Fields: Nanobiotechnology, Materials, Medicine, Dental care.

UNIT II NANO PARTICLES

Introduction, Types of Nanoparticles, Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic effects of Nanomaterials, Significance of Nanoparticles Nanofabrications- MEMS/NEMS, Atomic Force Microscopy, Self assembled monolayers/ Dip- pen Nanolithography, Soft Lithography, PDMS Molding, Nano Particles, Nano wires and Nanotubes.

UNIT III APPLICATIONS

Nanomedicine, Nanobiocensor and Nanofludics. Nanocrystals in biological detection, Electrochemical DNA sensors and Integrated Nanoliter systems. Nano-Biodevices and Systems.Fabrication of Novel Biomaterials through molecular self assembly- Small scale systems for in vivo drug delivery- Future nanomachine.

UNIT IV NANOBIOTECHNOLOGY

Clinical applications of nanodevices. Artificial neurons. Real-time nanosensors- Applications in cancer biology.Nanomedicine. Synthetic retinyl chips based on bacteriorhodopsins. High throughput DNA sequencing with nanocarbon tubules.Nanosurgical devices.

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UNIT V ETHICAL ISSUES IN NANOTECHNOLOGY

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With Especial Reference to Nanomedicine, Nanomedicine Applied in Nonmedical Contexts, Social Issues Relating to Nanomedicine. Social and Ethical Issues, Economic Impacts, Other Issues, Nanotechnology and Future Socio-economic challenges.

TEXT BOOKS

S.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF
	NAME			PUBLICATIONS
1	Niemeyer, C.M.	Nanobiotechnology: Concepts,	Wiley-	2004
	and Mirkin, C.A	Applications and	VCH	
		Perspectives		
2	Goodsell, D.S.	Bionanotechnology	John Wiley	2004
			and Sons, Inc	

REFERENCE BOOKS

S.N	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIONS
1	Shoseyov, O. and Levy, I	Nanobiotechnology: Bioinspired Devices and Materials of the Future	Humana Press	2007
2	Bhushan, B.	Springer Handbook of Nanotechnology	Springer- Verlag Berlin Heidelberg	2004
3	FreitasJr R.A	Nanomedicine	Landes Biosciences	2004
4	Kohler, M. and Fritzsche, W.	Nanotechnology – An Introduction to Nanostructuring Techniques	Wiley- VCH	2004

MECHANICAL ENGINEERING

16BEMEOE01

COMPUTER AIDED DESIGN

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Course Objective

- 1. To apply basic concepts to develop construction (drawing) techniques.
- 2. To ability to manipulate drawings through editing and plotting techniques.
- 3. To understand geometric construction and Produce template drawings.
- 4. To understand and demonstrate dimensioning concepts and techniques.
- 5. To understand Section and Auxiliary Views.
- 6. To become familiar with Solid Modelling concepts and techniques.

Course Outcomes

Upon completion of the course, the students will be able to

- 1. Apply basic concepts to develop construction (drawing) techniques.
- 2. Ability to manipulate drawings through editing and plotting techniques.
- 3. Understand geometric construction and Produce template drawings.
- 4. Understand and demonstrate dimensioning concepts and techniques
- 5. Understand Section and Auxiliary Views
- 6. Become familiar with Solid Modelling concepts and techniques.

UNIT I OVERVIEW OF CAD SYSTEMS 9

Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

UNIT IIINTERACTIVE COMPUTER GRAPHICS AND GRAPHICS9TRANSFORMATIONS

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Twoand Three – Dimensional graphics concepts, Graphical input technique, Geometric transformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRIC MODELING

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid. Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNIT IV PARAMETRIC DESIGN AND OBJECT REPRESENTATION

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

TOTAL:45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICAT ION
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICA TION
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	Dhanpat Rai & Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimisaiton Techniques	Wiley Eastern, New Delhi	2003

16BEMEOE02INDUSTRIAL SAFETY AND ENVIRONMENTL T P C 3 0 0 3

Course Objective

- 1. To recognize and evaluate occupational safety and health hazards in the workplace.
- 2. To determine appropriate hazard controls following the hierarchy of controls.
- 3. To analyses the effects of workplace exposures, injuries and illnesses, fatalities.
- 4. To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
- 5. To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
- 6. To prevent or mitigate harm or damage to people, property, or the environment.

Course Outcome

At the end of the course, student will be able to

- 1. Recognize and evaluate occupational safety and health hazards in the workplace.
- 2. Determine appropriate hazard controls following the hierarchy of controls.
- 3. Analyse the effects of workplace exposures, injuries and illnesses, fatalities.
- 4. Prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
- 5. Understand the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
- 6. Prevent or mitigate harm or damage to people, property, or the environment.

UNIT I INTRODUCTION TO LOGISTICS

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II PHASES OF SUPPLY CHAIN

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

UNIT IV SUPPLY CHAIN ACTIVITIES

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V SCM ORGANISATION AND INFORMATION SYSTEM

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

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TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICAT ION
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICAT ION
1	Nicolas.J.N	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	McGrawHill, New York	1998
2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

Upon completion of this course, the students can be able to

1. Generalized equations for mass, momentum and heat.

To generalized equations for mass, momentum and heat.
 To understand the concepts of Reynolds and Gauss theorems.

3. To learn combined diffusive and convective transport.

- 2. Understand the concepts of Reynolds and Gauss theorems.
- 3. Learn combined diffusive and convective transport.

16BEMEOE03

Course Objective

Course Outcomes

- 4. Apply Film- and penetration models for mass and heat transfer.
- 5. Apply Stefan-Maxwells equations for multi-component diffusion.

To apply Film- and penetration models for mass and heat transfer.
 To apply Stefan-Maxwells equations for multi-component diffusion.
 To Solve the given set of equations either analytically or numerically.

6. Solve the given set of equations either analytically or numerically.

UNIT I INTRODUCTION AND BASIC CONCEPTS

General overview of transport phenomena including various applications, Transport of momentum, heat and mass, Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II PROPERTIES, UNITS AND OTHERPHYSICAL PARAMETERS

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III MOMENTUM TRANSPORT

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV ENERGY TRANSPORT

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

TRANSPORT PHENOMENA

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UNIT V MASS TRANSPORT

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion- Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

TOTAL: 45 HOURS

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S. N O.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICA TION
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEBSITES

REFERENCE

1. <u>https://laulima.hawaii.edu/portal</u>

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16BEMEOE04 INTRODUCTION TO BIOMECHANICS

Course Objective

- 1. To describe the principles of the study of human movement.
- 2. To describe the range of factors that influence the initiation, production and control of human movement.
- 3. To identify the body's lever systems and their relationship to basic joint movement and classification.
- 4. To distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
- 5. To explain joint and muscle function and the forces acting upon the human body during various sporting activities.
- 6. To relate the different body systems necessary for human movement to occur.

Course Outcomes

Upon completion of this course, the students will be able to,

- 1. Describe the principles of the study of human movement.
- 2. Describe the range of factors that influence the initiation, production and control of human movement.
- 3. Identify the body's lever systems and their relationship to basic joint movement and classification.
- 4. Distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
- 5. Explain joint and muscle function and the forces acting upon the human body during various sporting activities.
- 6. Relate the different body systems necessary for human movement to occur.

UNIT I INTRODUCTION

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II KEY MECHANICAL CONCEPTS

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

UNIT IV ANATOMICAL DESCRIPTION

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V MECHANICS OF THE MUSCULOSKELETAL SYSTEM

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit -Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle -Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control

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REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICAT ION
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

16BEAEOE01

AUTOMOBILE ENGINEERING

Course Objectives:

- To impart knowledge on the constructional details and principle of operation of various automobile components.
- To learn the function and working of various components in transmission and drive lines.
- To study the concept and working of steering and suspension systems in an automobile.
- To give knowledge on the wheels, tyres and brakes of automobiles.
- To provide information on the current and future trends in automobiles.
- Identify and explain the types of steering system.

Course Outcomes:

Upon successful completion of the course, the students should be able to:

- Demonstrate the operating principles and constructional details of various automobile components.
- Explain the function and working of components in transmission and drive lines.
- Identify and explain the types of steering system.
- Identify and explain the types of suspension system.
- Classify and describe the types of wheels, tyres and brakes of automobiles.
- Discuss the current and future trends in the automobiles.

UNIT I ENGINE AND FUEL FEED SYSTEMS

Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburettor working principle, requirements of an automotive carburettor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT II TRANSMISSION SYSTEMS

Requirements of transmission system.Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. Course Objectives of the gearbox -Determination of gear ratios for vehicles.Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propeller Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNITILI SUSPENSION SYSTEM

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension - Pneumatic suspension - Hydro Elastic suspension - Shock absorbers. Vibration and

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driving comfort.

UNITIV BRAKES

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory, Brake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

UNITV ELECTRICAL SYSTEM

Principle and construction of lead acid battery. Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.Starting System and charging system.

TOTAL: 45 HOURS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	Ganesan.V	Internal Combustion Engines	TataMcGraw-HillPublishingCo., New Delhi	2003
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publisher	2011

TEXT BOOKS

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment, 3 rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAEInc	2001

16BEAEOE02 BASICS OF TWO AND THREE WHEELERS L T P C 3 0 0 3

Course Objectives

- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.
- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.

Course Outcomes

Upon successful completion of the course, the students should be able to:

- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
- Explain the servicing of two and three wheelers.

UNIT I INTRODUCTION

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNITII POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION

Types of clutches for 2 and 3 wheelers.Design of clutch system.Gears for two and three wheelers.Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs

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for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TOTAL: 45 HOURS

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century book house.	1988

REFERENCES:

SL. NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Griffin.M.M	Motor cycles from inside and outside.	Prentice Hall Inc, New Jersey.	1978
2.	Bruce A. Johns, David D. Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03AUTOMOBILE MAINTENANCEL T P C 3 0 0 3

Course Objectives

• The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems in Automobile.

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.

Course Outcomes

Upon successful completion of the course, the students should be able to:

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.
- Explain the fault diagnosis in the electrical and air conditioner systems.

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

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UNIT IV ELECTRICAL SYSTEM MAINTENANCE

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY 9

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TOTAL: 45 HOURS

TOTAL: 45 HOURS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF
				PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from	n Different Vehicle Manufact	urers	

TEXT BOOKS

Course Objectives:

- To impart knowledge on trends in the vehicle power plants.
- To learn the various advanced driver assistance systems.
- To study the working of advanced suspension and braking systems in an automobile.
- To give information about motor vehicle emission and noise pollution control.
- To provide knowledge of the vehicle telematics.
- To give information about the noise control techniques

Course Outcomes:

Upon successful completion of the course, the students should be able to:

- Distinguish and describe the various modern vehicle power plant systems.
- List and explain the various driver assistant mechanisms.
- Identify and describe the working of advanced suspension and braking systems.
- Apply the knowledge of motor vehicle emission and noise pollution control.
- Describe the noise control techniques
- Describe the vehicle telematics and its applications.

UNIT I TRENDS IN POWER PLANTS

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles - Electric propulsion with cables - Magnetic track vehicles.

UNIT II DRIVER ASSISTANCE SYSTEMS

Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNIT III SUSPENSION BRAKES AND SAFETY

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT V TELEMATICS

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

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TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	LjuboVlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth- Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	NavigationandIntelligentTransportationTransportationSystems-ProgressinTechnologyIn	Automotive Electronics Series,SAE, USA.	1998

REFERENCES

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William B Riddens	Understanding Automotive Electronics, 5 th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	Understanding Automotive Electronics	SAE	1998
3.	Robert Bosch	Automotive HandBook, 5 th Edition	SAE	2000
CIVIL ENGINEERING

16BECEOE01 HOUSING, PLAN AND MANAGEMENT LTPC3003

COURSE OBJECTIVES

- 1. To examine the role and tasks of basic housing policies and building bye laws
- 2. Understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors
- 3. Analyze the Innovative construction methods and Materials
- 4. Analyze city management strategies and strengthen the urban governance through a problem solving approach
- 5. To know the Importance of basic housing policies and building bye laws
- 6. To use Housing Programmes and Schemes

COURSE OUTCOME

The students will be able to

- 1. Know the Importance of basic housing policies and building by laws
 - 2. Use Housing Programmes and Schemes
 - 3. Plan and Design of Housing projects
 - 4. Examine Innovative construction methods and Materials
 - 5. Know Housing finance and loan approval procedures
 - 6. Understand Construction as well as managing techniques

UNIT I INTRODUCTION TO HOUSING

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Course Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies - levels -Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II HOUSING PROGRAMMES

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS

Formulation of Housing Projects - Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL

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Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Meera Mehta and Dinesh Mehta	Metropolitan Housing Markets	Sage Publications Pvt. Ltd., New Delhi	2002
2	Francis Cherunilam and Odeyar D Heggade	Housing in India Communication	Himalaya Publishing House, Bombay.	2001

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
		воок		PUBLICATION
1	-	Development Control Rules for Chennai Metropolitan Area	CMA, Chennai	2002
2	-	UNCHS, National Experiences with Shelter Delivery for the Poorest Groups	UNCHS (Habitat), Nairobi	2000

BUILDING SERVICES

L T P C 3 0 0 3

16BECEOE02 COURSE OBJECTIVES

- 1. Defining and identifying of eng. services systems in buildings.
- 2. The role of eng. services systems in providing comfort and facilitating life of users of the building.
- 3. The basic principles of asset management in a building & facilities maintenance environment
- 4. Importance of Fire safety and its installation techniques
- 5. To Know the principle of Refrigeration and application
- 6. To Understand Electrical system and its selection criteria

COURSE OUTCOME

The students will be able to

- 1. Machineries involved in building construction
- 2. Understand Electrical system and its selection criteria
- 3. Use the Principles of illumination & design
- 4. Know the principle of Refrigeration and application
- 5. Importance of Fire safety and its installation techniques
- 6. Know the principle behind the installation of building services and to ensure safety in buildings

UNIT I MACHINERIES

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant –

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Fan coil systems - Water piping - Cooling load - Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION

Causes of fire in buildings - Safety regulations - NBC - Planning considerations in buildings like noncombustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder - Fire lighting pump and water storage - Dry and wet risers -Automatic sprinklers

TOTAL: 45 HOURS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	E.R.Ambrose	Heat Pumps and Electric Heating	John and Wiley and Sons, Inc., New York	2002
2	-	Handbook for Building Engineers in Metric systems	NBC, New Delhi	2005

TEXT BOOKS

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
		BOOK		PUBLICATION
1	-	Philips Lighting in Architectural Design	McGraw-Hill, New York	2000
2	A.F.C. Sherratt	Air-conditioning and Energy Conservation	The Architectural Press, London	2005

16BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS L T P C 3 0 0 3

OBJECTIVES

1. To enable the students for a successful career as water management professionals.

2. To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.

3. To expose the students the need for an interdisciplinary approach in irrigation water management

4. To providing a platform to work in an interdisciplinary team.

5. To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.

6. To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

OUTCOME

At the end of this the students will be in a capacity to

1. Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.

2. Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management

3. Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.

4. Gain insight on local and global perceptions and approaches to participatory water resource management

5. Learn from successes and failures in the context of both rural and urban communities of water management.

6. Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector._

UNIT I IRRIGATION SYSTEM REQUIREMENTS

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNIT II IRRIGATION SCHEDULING

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III MANAGEMENT

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

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UNIT IV OPERATION

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V INVOLVEMENT OF STAKE HOLDERS

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
		BOOK		PUBLICATION
1	Dilip Kumar Majumdar	Irrigation Water Management – Principles and Practice	Prentice Hall of India Pvt. Ltd., New Delhi	2000
2	R.T. Gandhi, et. al.	Hand book on Irrigation Water Requirement	Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi	-

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
		BOOK		PUBLICATION
1	Maloney, C. and Raju, K.V	Managing Irrigation Together", Practice and Policy in India	Stage Publication, New Delhi, India	2000
2	-	Hand Book on Irrigation System Operation Practices	Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi	2000

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OBJECTIVE:

- 1. To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
- 2. To study different methods of construction to successfully achieve the structural design with recommended specifications.
- 3. To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
- 4. To study of construction equipment's, and temporary works required to facilitate the construction process
- 5. To provide a coherent development to the students for the courses in sector of Advanced construction technology.
- 6. To present the new technology of civil Engineering and concepts related Advanced construction technology.

OUTCOMES:

- 1. Implementation of new technology concepts which are applied in field of Advanced construction.
- 2. Different methods of construction to successfully achieve the structural design with recommended specifications.
- 3. Application of scientific and technological principles of planning, analysis, design and management to construction technology.
- 4. Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process
- 5. Development to the students for the courses in sector of Advanced construction technology.
- 6. The new technology of civil Engineering and concepts related Advanced construction technology.

UNIT - I MODERN CONSTRUCTION METHODS

Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT - II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES 9

Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNIT - III MODERN CONSTRUCTION EQUIPEMENTS -I

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting, Tunneling and hoisting

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UNIT - IV MODERN CONSTRUCTION EQUIPEMENTS -II

Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNIT - V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES 9

Principles and Practices of Temporary structures, Shoring, and Strutting, Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
		BOOK		PUBLICATION
1	Peurifoyu, R. L.,,	Construction	Mc Graw Hill Co	2000
	Ledbette, W.B	Planning,		
		Equipment and		
		Methods		
2	Antill J.M	PWD, Civil	Mc Graw Hill Book Co	2005
		Engineering		
		Construction		

REFERENCE

S. NO.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
		BOOK		PUBLICATION
1	Varma.M	Construction Equipment and its Planning & Applications	, Metropolitan Book Co	2000
2	Nunnaly.S.W	Construction Methods and Management	Prentice – Hall	2000
3	Ataev, S.S	Construction Technology	MIR , Pub	2000

LIST OF OPEN ELECTIVES OFFERED BY

ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT

16BEEEOE01

ELECTRIC HYBRID VEHICLE L T P C 3 0 0 3

Course Objectives

- To understand the basic concepts of electric hybrid vehicle.
- To gain the knowledge about electric propulsion unit.
- To gain the concept of Hybrid Electric Drive-Trains.
- To gain the different Energy Management Strategies.
- To study about the efficiency manipulation in drives
- To understand and gain the knowledge about various energy storage devices

Course Outcomes:

- Summarize the basic concepts in bioprocess Engineering.
- Explain the concept of Hybrid Electric Vehicles.
- Understand the concept of Hybrid Electric Drive-Trains.
- Identify the different Energy Management Strategies.
- Understand the concept of different Energy Storage devices.
- Analyze the different motor drives used in Hybrid Electric Vehicles.

UNIT I INTRODUCTION

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES

Introduction to energy management strategies used in hybrid and electric vehicles, classification

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of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Iqbal Hussein	Electric and Hybrid	CRC Press -2^{nd}	2010
		Vehicles: Design	edition	
		Fundamentals		

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Mehrdad Ehsani,	Modern Electric,	Standards media –	2009
	Yimi Gao,	Hybrid Electric and	2 nd edition	
	Sebastian E. Gay,	Fuel Cell		
	Ali Emadi	Vehicles:		
		Fundamentals, Theory		
		and Design		
2	James Larminie,	Electric Vehicle	Wiley -2^{nd} edition	2012
	John Lowry	Technology Explained		

16BEEEOE02 ENERGY MANAGEMENT AND ENERGY AUDITING L T P C 3 0 0 3

Course Objectives:

- To gain the knowledge about energy management.
- •To understand the basic concepts in economic analysis in energy management.
- To understand the basic principles of energy audit.
- To gain the knowledge about the basic concept of types of Energy Audit
- To gain and Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- To study about the behaviour changes of PF requirement in motor currents

Course Outcomes:

- At the end of this course, students will demonstrate the ability to
- Understand the concept of Energy Management.
- Analyze the different methods for economic analysis
- Knowledge about the basic concept of Energy Audit and types.
- Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- Investigate the different methods to improve power factor.

UNIT I ENERGY MANAGEMENT

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS

Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

UNIT III BASIC PRINCIPLES OF ENERGY AUDIT

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV ENERGY EFFICIENT MOTORS

Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-

Energy conservation: Importance-energy saving measures in DG set-fans and blowers pumpsair conditioning system- energy efficient transformers.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS 9

Power factor - methods of improvement, location of capacitors, p.f with non linear loads, effect of harmonics on p.f,- p.f motor controllers -Energy efficient lighting system design and

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practice- lighting control- Measuring Instruments - wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLCs.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Murphy W.R. and G.Mckay Butter worth	Energy Management	Heinemann Publications	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	John.C.Andreas	Energy Efficient Electric	Marcel Dekker Inc	2005
		Motors	Ltd – 3rd edition	
2	W.C.Turner Steve	Energy Management	(b) Lulu	2013
	Doty	Handbook	Enterprises,	
			Inc 8th	
			Edition	
			Volume II	

16BEEEOE03 PROGRAMMABLE LOGIC CONTROLLER L T P C 3 0 0 3

Course Objectives

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To gain the knowledge of storage techniques in PLC
- To acquire the knowledge about how to handle the data and functions
- To study about flowcharts of ladder and spray process system
- To understand the principles of PID.

Course Outcome

• At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.

- To acquire the knowledge of storage techniques in PLC
- Students know how to handle the data and functions
- Students known about advanced controller in PLC applications
- Students gather real time industrial application of PLC
- Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	JR Hackworth	Programmable Logic	Pearson	2006
	and F.D	Controllers – Programming		
	Hackworth – Jr	Method and Applications		

REFERENCES

S.	Author(s)	Title of the Book	Publisher	Year of
No.	Name			Publication
1	John Webb and	Programmable Logic	Fifth edition, PHI	2004
	Ronald A Reiss	Controllers – Principle and		
		Applications		
2	W.Bolton	Programmable Logic	Elsevier Newnes	2009
		controller	Publications, 5 th	
			Edition	

WEBSITE

<u>http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,-</u> Introduction to programmable Logic controller

16BEEEOE04

RENEWABLE ENERGY RESOURCES LTPC3003

Course Objectives

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- •To understand the basic principles fuel cell, Geo thermal power plants.
- To gain the knowledge about hydro energy.
- To study about solar energy collectors and its storages
- To study about the inter connected system in wind power

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Analyze the Energy Scenario in india
- Understand the concept of Solar Energy
- Understand the concept of Wind Energy
- Understand the concept of Hydro Energy
- Analyze the different energy sources
- Students gathered the real time inter connected system modelling in wind power

INTRODUCTION UNIT I

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

SOLAR ENERGY UNIT II

Introduction to solar energy: solar radiation, availability, measurement and estimation- Solar thermal conversion devices and storage - solar cells and photovoltaic conversion - PV systems -MPPT. Applications of PV Systems - solar energy collectors and storage.

UNIT III WIND ENERGY

Introduction - Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration - basic-Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy - Inter connected systems.

UNIT IV HYDRO ENERGY

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V **OTHER SOURCES**

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL: 45 HOURS

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TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional sources of energy	Khanna publishers	2011
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. & Parulekar	Energy Technology	Khanna publishers, Eleventh Reprint	2013
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis – 3 rd edition	2015

WEBSITES

1. <u>www.energycentral.com</u>

2. <u>www.catelelectricpowerinfo.com</u>