B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM AND SYLLABI 2017

(FULL TIME PROGRAMME)

Department of Electrical and Electronics Engineering

FACULTY OF ENGINEERING

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KARPAGAM
ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)

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Pollachi Main Road, Eachanari Post,
Coimbatore- 641021, India.

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OFSTUDYAND SCHEME OFEXAMINATIONS
(2017 and onwards)

SEMESTER I

COURSE CODE	COURSETITLE	SUB AREA	PEO	PO	L	T	P	C	CIA	ESE	TOTAL	CONTACT HOURS /WEEK
THEORY:												
17BECC101	English for Engineers	HS	2	i,j,l	3	0	0	3	40	60	100	3
17BECC102	Engineering Mathematics-I	BS	2	a,b,e,l,	3	2	0	4	40	60	100	5
17BEPH103/ 17BECH103	Engineering Physics/Engineering Chemistry **CHOICE BASED**	BS	1,2	a,b,c,e,g,l	3	0	0	3	40	60	100	3
17BEEE104	Basic Electrical Engineering	ES	1,2	a,b,c,e,g,l,	3	0	0	3	40	60	100	3
17BEEE105	Basic Electronics Engineering	ES	1,2	a,b,c,e,g,l,	3	0	0	3	40	60	100	3
PRACTICAL:												
17BEPH111/ 17BECH111	Engineering Physics Laboratory /Engineering Chemistry Laboratory **CHOICE BASED**	BS	1,2	a,b	0	0	4	2	40	60	100	4
17BEEE112	Engineering Workshop Practices Laboratory	ES	1,2	a,c,d,e,f ,j	0	0	4	2	40	60	100	4
17BEEE113	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**

VALUE ADDED COURSE

17BECC151*	Yoga	MC	1,2	c,d,e,f	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =31 Hours												

SEMESTER 2												
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/ WEEK**
THEORY												
17BECC201A/ 17BECC201B	Business Communication/ Technical English **CHOICE BASED**	HS	1,2	i,j,l	3	0	0	3	40	60	100	3
17BECC202	Engineering Mathematics-II	BS	2	a,b,c,e,l	3	2	0	4	40	60	100	5
17BEPH203/ 17BECH203	Engineering Physics/Engineering Chemistry **CHOICE BASED**	BS	1,2	a,b	3	0	0	3	40	60	100	3
17BECC204	Environmental Sciences	HS	1	a,c,e,f,g, h,l	3	0	0	3	40	60	100	3
17BEEE205	Analysis of Electric Circuits	ES	1	a,b,c,d,e,l	3	2	0	4	40	60	100	5
PRACTICAL												
17BEPH211/ 17BECH211	Engineering Physics Laboratory/Engineering Chemistry Laboratory **CHOICE BASED**	BS	1,2	a,b	0	0	4	2	40	60	100	4
17BEEE212	Electric Circuits Laboratory	ES	2	a,c,d,e,f, j,l	0	0	3	2	40	60	100	3
17BEEE213	Engineering Graphics	ES	1,2	c,d	1	0	3	3	40	60	100	3
TOTAL					**16**	**4**	**10**	**24**	**320**	**480**	**800**	**29**

VALUE ADDED COURSE

17BECC251*	Business Plan	MC	1,2		1	0	0	-	100*	-	-	1
Total Contact Hours/Week =30 Hours												

SEMESTER III

SEMESTER 3												
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/ WEEK**
THEORY												
17BEEE301A/ 17BEEE301B	Methods of Applied Mathematics /Linear Algebra and Special Functions **(CHOICE BASED)**	BS	1,2	a,b,c,e,l	3	2	0	4	40	60	100	5
17BEEE302	Electrical Machines-I **(HC)**	PC	1	a,b,c,d,e,j	3	0	0	3	40	60	100	3
17BEEE303	Electromagnetic Theory **(HC)**	PC	1	a,b,c,d,e,j	3	0	0	3	40	60	100	3
17BEEE304	Electronic Devices and Circuits	PC	2	a,b,c,d,e, l	3	0	0	3	40	60	100	3
17BEEE305A/ 17BEEE305B	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												
17BEEE311	Electrical Machines – I Laboratory	PC	1	a,d,e,k,l	0	0	3	2	40	60	100	3
17BEEE312	Electronic Devices and Circuits Laboratory	PC	2	a,d,e,k,l	0	0	3	2	40	60	100	3
17BEEE313	Basic Simulation Laboratory for Electrical Systems	ES	1	a,d,e,j,k,l	0	0	3	2	40	60	100	3
17BEEE314	Course Oriented Project- I				0	0	1	1	100	-	100	1
TOTAL					**15**	**2**	**10**	**23**	**420**	**480**	**900**	**27**

VALUE ADDED COURSE

17BEEE351*	Introduction to Solar PV Design/ Introduction to IoT	MC	1,2	a,b,c,d,e ,l	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =28 Hours												

SEMESTER IV

SEMESTER 4												
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/ WEEK**
THEORY												
17BEEE401	Electrical Machines - II **(HC)**	PC	1	a,b,c,d,e g,l	3	2	0	4	40	60	100	5
17BEEE402	Transmission and DistributionSystems **(HC)**	PC	1	a,b,c,d,e g,l	3	0	0	3	40	60	100	3
17BEEE403A/ 17BEEE403B	Measurements and Instrumentation /Transducer Engineering **(SC) (CHOICE BASED)**	PC	1	a,b,c,d,e,l	3	0	0	3	40	60	100	3
17BEEE404	Linear Integrated Circuits **(HC)**	PC	2	a,b,c,e,	3	0	0	3	40	60	100	3
17BEEE405A/ 17BEEE405B	Basic Thermodynamics and Energy Conversion Devices/ Engineering Materials **(CHOICE BASED)**	ES	1,2	a,b,c,d,e,g, l	3	0	0	3	40	60	100	3
PRACTICAL												
17BEEE411	ElectricalMachines Laboratory–II	PC	1	a,b,c,d,e,l	0	0	3	2	40	60	100	3
17BEEE412	Scientific Computing Laboratory	BS	2	a,b,c,e	2	0	2	3	40	60	100	3
17BEEE413	Measurements and Instrumentation Laboratory	PC	1	a,d,e,j,k,l	0	0	3	2	40	60	100	3
17BEEE414	Course Oriented Project- II	ES	-	-	0	0	1	1	100	-	100	1
TOTAL					**15**	**2**	**9**	**24**	**420**	**480**	**900**	**27**

VALUE ADDED COURSE

17BEEE451*	Electricity Standards	MC	1,2	a,b,c,d,e ,l	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =28 Hours												

SEMESTER V

SEMESTER 5												
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/ WEEK**
THEORY												
17BEEE501	PowerElectronics **(HC)**	PC	2	a,b,c,d, e,g	3	0	0	3	40	60	100	3
17BEEE502	Digital Logic Circuits	PC	2	a,d,e	3	0	0	3	40	60	100	3
17BEEE503	Control System Engineering**(HC)**	PC	1	a,b,c,d,e,l	3	2	0	4	40	60	100	5
17BEEE5E_ _	Professional Elective-I **(CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
17BEEE5E_ _	Professional Elective-II**(CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
PRACTICAL												
17BEEE511	Power Electronics Laboratory	PC	2	a,c,d,j,k,l	0	0	3	2	40	60	100	3
17BEEE512	Analog and Digital Circuits Laboratory	PC	2	a,d,e,k,l	0	0	3	2	40	60	100	3
17BEEE513	Control System Engineering Laboratory	PC	1	c,d,e,f,i,j	0	0	3	2	40	60	100	3
17BEEE514	Course Oriented Project- III	ES	-	-	0	0	1	1	100	-	100	1
TOTAL					**15**	**4**	**10**	**23**	**420**	**480**	**900**	**27**

VALUE ADDED COURSE

17BEEE551*	In plant Training	MC	-	-	-	0	0	-	100*	-	-	-
17BEEE552*	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 =28 Hours												

SEMESTER VI

SEMESTER 6												
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/WEEK**
THEORY												
17BEEE601	Solid StateDrives**(HC)**	PC	2	a,b,c,d,e,g	3	0	0	3	40	60	100	3
17BEEE602	Power System Analysis**(HC)**	PC	2	a,b,c,d,e,g,l	3	2	0	4	40	60	100	5
17BEEE603A/ 17BEEE603B	Microprocessor and Microcontroller/Microprocessorbased system design (**SC) CHOICE BASED**	PC	1	a,b,c,e,h,k,l	3	0	0	3	40	60	100	3
17BEEE604	Design of Electrical Apparatus**(HC)**	PC	1	a,c,d,g,l	3	0	0	3	40	60	100	3
17BEEE6E_ _	Professional Elective-III **(CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
17BEEE6E_ _	Professional Elective-IV (**CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
PRACTICAL												
17BEEE611	Micro Processor and Micro Controller Laboratory	PC	2	a,c,d,j,k,l	0	0	3	2	40	60	100	3
17BEEE612	Electrical Estimation and Rewinding Laboratory	PC	1,2	a,c,d,e,f,g	0	0	3	2	40	60	100	3
17BEEE613	Course Oriented Project- IV	ES	1,2	-	0	0	1	1	100	-	100	1
TOTAL					**18**	**0**	**7**	**24**	**420**	**480**	**900**	**27**

VALUE ADDED COURSE

17BEEE651*	PCB Design and Servicing of Domestic Appliances	MC	1,2	a,b,d,e,l	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =28 Hours												

SEMESTER VII

SEMESTER 7												
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/WEEK**
THEORY												
17BECC701	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
17BEEE702	Power System Protection and Switchgear**(HC)**	PC	2	a,b,c,d,e g,l	3	0	0	3	40	60	100	3
17BEEE7E_ _	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												
17BEEE711	Power System Simulation Laboratory	PC	1	a,c,d,j,k,l	0	0	3	2	40	60	100	2
17BEEE791	Project work-Phase- I	PW	1,2	-	0	0	8	4	40	60	100	8
TOTAL					**15**	**0**	**11**	**21**	**280**	**420**	**700**	**25**

VALUE ADDED COURSE

17BEEE751*	ETAP and PSCAD	MC	1,2	a,b,d,e,l	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =26 Hours												

SEMESTER VIII

SEMESTER 8												
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/WEEK**
THEORY												
17BEEE801A/ 17BEEE801B	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
17BEEE8E_ _	Professional Elective-VI**(CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
PRACTICAL												
17BEEE891	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 Contact Hours/Week =38 Hours												

L: Lecture Hour **T: Tutorial Hour** **CIA:**
P:Practical Hour **C:No. of Credits** **ESE: End Semester Examination**
V AC: Value Added Course

Total Credits earned: 23+24+23+24+23+24+21+22=184

against the specified range –[175-185 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=100 Marks].

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 OFPROFESSIONALELECTIVES

PROFESSIONALELECTIVE-I AND PROFESSIONALELECTIVE-II V SEMESTER											
S. No	**SUB. CODE**	**TITLE OFTHE COURSE**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	17BEEE5E01	Network Analysis and Synthesis	2	a,d,e	3	0	0	3	40	60	100
2	17BEEE5E02	Advanced Control System	2	b,c,h,i	3	0	0	3	40	60	100
3	17BEEE5E03	Electric Hybrid Vehicle	2	a,c,d,h	3	0	0	3	40	60	100
4	17BEEE5E04	Communication Engineering	1	-	3	0	0	3	40	60	100
5	17BEEE5E05	Introduction to Neural Networks	1	a,c,e,g,l	3	0	0	3	40	60	100
6	17BEEE5E06	Computer Architecture	1	a,c,e	3	0	0	3	40	60	100
7	17BEEE5E07	Data Structure and Algorithm	1	e,f,i	3	0	0	3	40	60	100
8	17BEEE5E08	Fuzzy Logic and its applications	1	a,c,e,n	3	0	0	3	40	60	100
9	17BEEE5E09	Distributed Generation	2	c,d,e,g,h,i	3	0	0	3	40	60	100
10	17BEEE5E10	Digital Signal Processing	1	a,b,c,d,e,g,l,n	3	0	0	3	40	60	100
11	17BEEE5E11	Industrial Automation	1	a,c,d,e,k,m,n	3	0	0	3	40	60	100
12	17BEEE5E12	Sensor and Transducer	1	a,b,c,e,i	3	0	0	3	40	60	100
13	17BEEE5E13	Intellectual Property Rights	1	h,j,l	3	0	0	3	40	60	100
PROFESSIONALELECTIVE-III AND PROFESSIONAL ELECTIVE-IV,VI SEMESTER											
14	17BEEE6E01	Computer Organization andArchitecture	1	a,c,e	3	0	0	3	40	60	100
15	17BEEE6E02	Embedded System	1	-	3	0	0	3	40	60	100
16	17BEEE6E03	Programmable Logic Controller and its Applications	1,2	a,b,d,e,l	3	0	0	3	40	60	100

17	17BEEE6E04	Computer Networks	1	a,c,e	3	0	0	3	40	60	100
18	17BEEE6E05	High Voltage Engineering	2	a,b,c,d,e,g,l	3	0	0	3	40	60	100
19	17BEEE6E06	Special Electrical Machines	2	a,c,d,e,h	3	0	0	3	40	60	100
20	17BEEE6E07	Fibre Optics and Laser Instruments	1	a,b,e,k,l,m	3	0	0	3	40	60	100
21	17BEEE6E08	Mobile Communication	1	a,b,d,e	3	0	0	3	40	60	100
22	17BEEE6E09	Switched Mode Power Conversion	2	a,c,e	3	0	0	3	40	60	100
23	17BEEE6E10	Biomedical Instrumentation	1,2	a,c,d,e,f,m,n	3	0	0	3	40	60	100
24	17BEEE6E11	Modern semiconductor Devices	2	a,c,d,e,g	3	0	0	3	40	60	100
25	17BEEE6E12	Power System Operation andControl	2	a,c,e	3	0	0	3	40	60	100
PROFESSIONALELECTIVE-V VII SEMESTER											
26	17BEEE7E01	Artificial Intelligence and Expert Systems	2	a,c,e	3	0	0	3	40	60	100
27	17BEEE7E02	HVDC and EHVAC	2	a,b,c,h,i,l	3	0	0	3	40	60	100
28	17BEEE7E03	Power System Economics	2	a,c,e	3	0	0	3	40	60	100
29	17BEEE7E04	Power System Restructuring and Deregulation	2	a,c,e,j,k,l	3	0	0	3	40	60	100
30	17BEEE7E05	Power Quality	2	a,c,d,e,h,l	3	0	0	3	40	60	100
31	17BEEE7E06	Power System Dynamics	2	a,c,e	3	0	0	3	40	60	100
32	17BEEE7E07	Computer Aided Analysis and Design of Electrical Apparatus	1	a,c,d,g	3	0	0	3	40	60	100
33	17BEEE7E08	Digital System Design Using VHDL	1	a,c,e,h,l	3	0	0	3	40	60	100
34	17BEEE7E09	Optimization Techniques	2	a,c,e	3	0	0	3	40	60	100
35	17BEEE7E10	Real Time Operating System	1	a,c,e.j.l,n	3	0	0	3	40	60	100

36	17BEEE7E11	Advances in Soft Computing	1	a,c,e	3	0	0	3	40	60	100
PROFESSIONALELECTIVE-VI VIII SEMESTER											
37	17BEEE8E01	Flexible AC Transmission Systems	2	a,b,c,e,j,l	3	0	0	3	40	60	100
38	17BEEE8E02	Power System Stability	2	d,e	3	0	0	3	40	60	100
39	17BEEE8E03	Power Generation Systems	2	c,d,e,g,h,i	3	0	0	3	40	60	100
40	17BEEE8E04	Total Quality Management	1	b,e,f,g,h,i,j	3	0	0	3	40	60	100
41	17BEEE8E05	Virtual Instrumentation	1	a,b,e,h,l,m,n	3	0	0	3	40	60	100
42	17BEEE8E06	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& Humanities											
SL. No.	**SUB. CODE**	**TITLE OFTHE COURSE**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	17BESHOE01	Probability and Random Process	1,2	a,c,d,h,j	3	0	0	3	40	60	100
2	17BESHOE02	Fuzzy Mathematics	1	a,b,c	3	0	0	3	40	60	100
3	17BESHOE03	Linear Algebra	1	a,g,h,j	3	0	0	3	40	60	100
4	17BESHOE04	Engineering Acoustics	1,2	a,b,g,h,j	3	0	0	3	40	60	100
5	17BESHOE05	Solid Waste Management	1,2	a,b,c,g	3	0	0	3	40	60	100
6	17BESHOE06	Green Chemistry	1,2	a,b,c,g	3	0	0	3	40	60	100
7	17BESHOE07	Applied Electrochemistry	1,2	a,b,c,	3	0	0	3	40	60	100
8	17BESHOE08	Industrial Chemistry	1,2	a,b,c,	3	0	0	3	40	60	100
9	17BESHOE09	English for Technocrats	1,2	a,b,c,d,g,h,j	1	4	0	3	40	60	100
Computer Science Engineering											
10	17BECSOE01	Internet Programming	1,2	a,b,c,g,h	3	0	0	3	40	60	100
11	17BECSOE02	Multimedia and Animation	1,2	a,b,c,g,h,j	3	0	0	3	40	60	100
12	17BECSOE03	PC Hardware and Trouble shooting	1	a,b,c,d,j	3	0	0	3	40	60	100
13	17BECSOE04	Java Programming	1,2	a,b,c,d,	3	0	0	3	40	60	100
Electronics and Communication Engineering											
14	17BEECOE01	Real Time Embedded Systems	1,2	a,b,c,d	3	0	0	3	40	60	100
15	17BEECOE02	Consumer Electronics	1	a,b,c,j	3	0	0	3	40	60	100
16	17BEECOE03	Neural Networks and its Applications	1	a,b,c,d	3	0	0	3	40	60	100
17	17BEECOE04	Fuzzy Logic and its Applications	1,2	a,d,g,h,j	3	0	0	3	40	60	100

Bio Technology											
18	17BTBTOE01	Bioreactor Design	1,2,	a,b,c,	3	0	0	3	40	60	100
19	17BTBTOE02	Food Processing and Preservation	1,2	a,b,d	3	0	0	3	40	60	100
20	17BTBTOE03	Basic Bioinformatics	1	a,b,c,	3	0	0	3	40	60	100
21	17BTBTOE04	Fundamentals of Nano Biotechnology	1	a,b,c,d,g, h,j	3	0	0	3	40	60	100
Mechanical Engineering											
22	17BEMEOE01	Computer Aided Design	1	a,b,c,d	3	0	0	3	40	60	100
23	17BEMEOE02	Industrial Safety and Environment	1	a,b,d,g	3	0	0	3	40	60	100
24	17BEMEOE03	Transport Phenomena	1,2	a,b,c,d	3	0	0	3	40	60	100
25	17BEMEOE04	Introduction to Biomechanics	1,2	a,b,c,d,g ,h,j	3	0	0	3	40	60	100
Automobile Engineering											
30	17BEAEOE01	Automobile Engineering	1,2	a,b,d,g	3	0	0	3	40	60	100
31	17BEAEOE02	Basics of Two and Three Wheelers	1,2	a,b,d,	3	0	0	3	40	60	100
32	17BEAEOE03	Automobile Maintenance	1	a,b,c	3	0	0	3	40	60	100
33	17BEAEOE04	Introduction to Modern Vehicle Technology	1,2	a,b,c	3	0	0	3	40	60	100
Civil Engineering											
34	17BECEOE01	Housing, Plan and Management	1,2	a,b,c,d	3	0	0	3	40	60	100
35	17BECEOE02	Building Services	1,2	a,b,c,d	3	0	0	3	40	60	100
36	17BECEOE03	Management of Irrigation Systems	1,2	a,b,c, d	3	0	0	3	40	60	100
37	17BECEOE04	Advanced Construction Technology	1,2	a,b,d	3	0	0	3	40	60	100

List of Electives Offered to Other Departments Electrical and Electronics Engineering											
38	17BEEEOE01	Electric Hybrid Vehicle	2	a,c,d,h,m,n	3	0	0	3	40	60	100
39	17BEEEOE02	Energy Management and Energy Auditing	2	b,e,f,g,h,i,j,n	3	0	0	3	40	60	100
40	17BEEEOE03	Programmable Logic Controller	1,2	a,b,d,e,l	3	0	0	3	40	60	100
41	17BEEEOE04	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

PROGRAM OUTCOMES: On successful completion of the programme,

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

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 EDUCATIONAL OBJECTIVES	**PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES**													
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
1	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓
2	✓	✓	✓	✓	✓	✓		✓		✓			✓	✓

SEMESTE30R I

17BECC101 ENGLISH FOR ENGINEERS L 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 formal context

Course Outcomes

Students undergoing this course will be able to

1. To use English language for communication: verbal & non-verbal.
2. To enrich comprehension and acquisition of speaking & writing ability.
3. To inculcate the habit of reading and to develop their effective reading skills.
4. To hone their listening, speaking, Reading and writing skills.
5. To gain confidence in using English language in real life situations.
6. To improve word power: lexical, grammatical and communication competence.

Unit- I LSRW SKILLS & GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 9

Listening –Types of listening- Listening to class reading - Video tapes/ Audio tapes. **Speaking** – Introduction on self. **Reading** - Reading for comprehension – Reading different kind of passages like descriptive, narrative, **Course Objectives**, conversational and argumentative. **Writing** – Formal and Informal letters- Letters to the Editor.

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Tenses -Articles. **Vocabulary** - Word Formation – Word expansion (Root word) - Prefix and Suffix.

Unit – II LSRW SKILLS & GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 8

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

answering questions. **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 & Vocabulary (Function Grammar & Technical Vocabulary)

Unit-III LSRW SKILLS & GRAMMAR

WH questions –Yes/No Question - Subject Verb agreement. **Vocabulary** – Compound Nouns/Adjectives – Irregular verbs.

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 8

Listening – Listening for specific task – fill in the gaps. **Speaking** – Phonemes – Syllables – Role play – Conversation Practice. **Reading** –comprehension passages based on general topics or matters of current affairs. **Writing** - Autobiographical writing & Biographical writing.

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Preposition – Infinitive & Gerund. **Vocabulary** – Foreign words used in English – British and American usage.

Unit- IV LSRW SKILLS & GRAMMAR, CAREER ORIENTED

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 10

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) & Instruction writing.

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Parts of Speech , Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

Unit- V LSRW SKILLS & GRAMMAR, FIELD WORK

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 10

Listening –Distinction between native and Indian English (Speeches by TED and Kalam). **Speaking**- Extempore talk –Just-a-minute talk. **Reading**-Reading strategies–Intensive reading – Text analysis. **Writing** - Creative writing – Writing circulars and notices – Writing proposal.

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

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

TEXT BOOK:

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

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2009
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:

www.learnerstv.com – Listening/ Speaking/ Presentation

www.usingenglish.com – Writing/ Grammar

www.englishclub.com – Vocabulary Enrichment/ Speaking

www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking

www.teachertube.com – Writing Technically

www.Dictionary.com – Semantic / Grammar

17BECC102 ENGINEERING MATHEMATICS –I L T P C 3 2 0 4

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 vector differentiation.
6. To study the algebraic manipulation

Course Outcomes:

The student will be able to

1. Acquire the basic knowledge and understanding of mathematics.
2. Apply advanced matrix knowledge to engineering problems.
3. Understand the concepts of differential calculus problems.
4. Improve their ability in evaluating geometrical applications of differential calculus problems.
5. To solve the problems by applying the differential Equations.
6. Evaluating engineering problems involving vector differentiation.

UNIT I MATRICES 12

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 12

Limits, Continuity (Concepts only)- Differentiation- Differentiation Techniques: standard formulae, product rule, quotient rule, chain rule, method of substitution, implicit functions and successive differentiation.

UNIT III GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS 12

Curvature – centre, radius and circle of curvature in Cartesian co- ordinates – Evolutes – Envelope – Evolute as envelope of normals.

UNIT IV DIFFERENTIAL EQUATIONS 12

Introduction to Ordinary differential equations: Linear ordinary differential equations of second and higher order with constant coefficients.

Introduction to Partial differential equations: Linear Partial differential equations of second and higher order with constant coefficients.

UNIT V VECTOR DIFFERENTIATION **12**

Vectors-Differentiation of vectors – scalar and vector point functions –vector operator – vector operator applied to scalar point functions: Gradient; vector operator applied to vector point functions: Divergence and curl; Physical interpretation of divergence and curl, Directional derivative, solenoidal and irrotational vectors.

TOTAL: 60 HOURS

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics	McGraw Hill Education (India) Private Limited, New Delhi.	2014
2	Sundaram, V. Lakhminarayan,K.A. &Balasubramanian,R.	Engineering Mathematics for first year.	Vikas Publishing Home, New Delhi.	2006
3	Bali, N.P. & Manish Goyal	A Text Book of Engineering Mathematics	Laxmi Publications Pvt. Ltd., New Delhi.	2014

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Grewel . B. S.	Higher Engineering Mathematics	Khanna Publications, New Delhi.	2014

2	BhaskarRao. P. B, Sri Ramachary SKVS, BhujangaRao. M	Engineering Mathematics I	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES:

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

17BEPH103 ENGINEERING PHYSICS L T P C 3 0 0 3

Course Objectives:

1. To understand the properties of matter and thermodynamics with its applications.
2. To introduce the concepts of light, laser and fiber optics for diverse applications.
3. To study the fundamentals of quantum physics and their applications.
4. To comprehend the properties of crystal and its various crystal structures.
5. To study the basics of sound and ultrasonics with appropriate applications.
6. 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 9

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), Poisson‟s ratio- Torsional pendulum- bending of beams - bending moment – uniform and non uniform bending

Thermodynamics – laws of thermodynamics- concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS 9

Introduction – emission and absorption process- Einstein‟s coefficients derivation. Types of LASER - CO_2, 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 9

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

UNIT IV CRYSTAL PHYSICS 9

Lattice – unit cell – Bravais lattice – 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 9

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, 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-641 001	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF 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
5	**P. Khare, A. Swarup**	Engineering Physics: Fundamentals and Modern Applications	Jones & Bartlett Learning	2009

WEBSITES:

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

17BECH103 ENGINEERING CHEMISTRY L T P C 3 0 0 3

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 combustion.
- To develop an understanding of the basic concepts of corrosion science.
- To acquaint the students with the basics of surface chemistry.
- To get the knowledge of fuels and combustion

Course Outcomes:

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

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

UNIT I WATER TECHNOLOGY 9

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination (No problems) – Hardness – Types and estimation by EDTA method (No 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 9

Electrolytic conductance-application (conductometric titration)- 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) –- Batteries- Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELS AND COMBUSTION 9

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- Problems on Calculation of GCV & NCV - Flue gas analysis.

UNIT IV CORROSION SCIENCE **9**

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 of Cu over Fe and Electro less plating (Ni) - Surface conversion coating - Hot dipping.- Anodizing of Al

UNIT V SURFACE CHEMISTRY AND PHASE RULE **9**

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

TEXT BOOKS:

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

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., 3rd Reprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010

3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
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) 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

17BEEE104 BASIC ELECTRICAL ENGINEERING L T P C 3 0 0 3

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 analyse 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 9

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 9

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) 9

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) 9

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.

TOTAL: 45 HOURS

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

17BEEE105 BASIC ELECTRONICS ENGINEERING L T P C 3 0 0 3

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 9

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

UNIT II- SEMICONDUCTOR DEVICES 9

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

UNIT III – OPTOELECTRONIC DEVICES 9

Construction and Operation: LED, LCD, 7-Segment Display, LDR, Photodiode, Phototransistor, Solar cell, Opto couplers

UNIT IV- TRANSDUCERS 9

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 9

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

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Thyagarajan.T, Sendur Chelvi.K.P, Rangaswamy.T.R	Basics:Electrical, Electronics and Computer Engineering	New Age International,Third Edition	2007
2	Somanathan Nair.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

17BEPH111 ENGINEERING PHYSICS LABORATORY L T P C 0 0 4 2

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

17BECH111 ENGINEERING CHEMISTRY LABORATORY L T P C 0 0 4 2

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

1. The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
2. Estimate the amount of alkalinity ions, hardness, chloride in water sample
3. Measure molecular/system properties of conductance of solutions, EMF etc
4. Acquaint the students with the determination of molecular weight of a polymer by visocometry
5. Determine the corrosion rate of steel by weight loss method.
6. 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 SO_4.
8. pH Titration (acid & base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$).
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.

17BEEE112 ENGINEERING WORKSHOP PRACTICES LABORATORY L T P C 0 0 4 2

Course Objectives

- 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 for understanding operations of CNC machines
- To prapare for assembling different componenets in engineering division
- To prepare for carpenter working tools handling
- 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.
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.

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

17BEEE113 COMPUTER 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 analyse 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
2. 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.

TOTAL: 45 HOURS

REFERENCES:

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

17BECC151* **YOGA** **L T P C 1 0 0**

Course Objective:

- To get knowledge about Concept of yoga
- To get knowledge about systems of yoga
- To get knowledge of different asanas
- To get knowledge of different advance asanas
- To get knowledge of pranayama
- To get knowledge mudras

Course Outcomes:

Yoga Education Helps to Develop • The Self Discipline, • Self Control, • Physical health, • Concentration • Higher Level Of Consciousness. • Mental Health

UNIT- I

Introduction To Yoga- Meaning Of Yoga – Concept Of Yoga- Aim And **Course Objectives** Of Yoga –History Of Yoga - Systems Of Yoga.- Stages (Or) Limbs Of Yoga

UNIT- II

Asanas-Surya Namashkar- Thdasana- Veerabadhra Asana- Trikonasana- Utkatasana- ArdhaChakrasana- Ardha Kati Chakrasana- Thandasana- Gomugasana- Padmasana- Vajrasana- Paschimottasana- Matsyendrasana-BavanaMukthasana- SuptaPadhangusthasana-Sethubhandhasana- Navasana- ArdhaBavanamukthasana- Mathasyasana- Naukasana- Bujangasana- Salabasana- Makkarasana-Dhanurasana.

UNIT- III

Advance Asanas- Sirasasana- Garudasana- Natrajasana- Rajakoptasana- Chakrasana- Kukutasana- Virikshasana- Sarvagasana- Halasana-. Mayurasana .

UNIT- IV

Pranayama- Meaning- Types Of Pranayama- Bhastrika- Bhramari- Udgeeth- Kabalbhati- Bahya- AnulomVilom- Pranay Pranayama- Benefits Of Pranayama. Neti - JalaNeti , Sutra Neti, Nouli-Three Types, Douthy-Three Types

UNIT- V

Mudras- Uses Of Mudras- Gyan- Shoonya- Apaan- Prana- Vayu- Prithvi- Linga- Apana- Adi Mudra- - Agni Mudra- Surya Mudra- Varuna- Hakini Mudra.

REFERENCES:

S.No	Author Name	Title Of Book	Publisher	Yearof Publication
1.	Dr.K.Chandrasekaran	Sound Health Through Yoga	PremKalyan	2009
2.	B.K.S.Iyangar	Light On Pranayama	Crossroad Centuary	2013
3.	Thirumular	Thirumandhiram	Sriramakrishna Math	2016

SEMESTER II

17BECC201A BUSINESS COMMUNICATION L T P C 3 0 0 3

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 skills and assertive

Course Outcomes:

Students undergoing this course will be able to

- 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.
- To gain confidence in using English language in real life situations.
- 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.

UNIT I **7**

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

UNIT II **10**

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- interpretation of graphs using expressions of comparison and contrast .

UNIT III **9**

Reading and Understanding the news articles - Oral Business Communication - First Impressions - Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage 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 **9**

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 **10**

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

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF 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

- http://tribehr.com/social-hr-software/talent-management/skills-tracking
- www.ispeakyouspeak.blogspot.com
- https://alison.com/subjects/6/Personal-Development-Soft-Skills
- http://www.niit.com/solution/soft-skill-training
- 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.

17BECC201B TECHNICAL ENGLISH L T P C 3 0 0 3

Course Objectives:

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

Course Outcomes:

Students undergoing this course will be able to

- To acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- To enhance them reading texts critically and analytically.
- To 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.
- To enrich the ability to face interviews the confidence.
- To help students develop listening skills for academic and professional purposes.
- To enable students write letters effectively in informal and business situations.

UNIT-1 LSRW SKILLS & GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 9

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 & Vocabulary (Function Grammar & Technical Vocabulary)

Regular & Irregular verbs - Kinds of sentences - Question tags. Homonyms and Homophones.

UNIT-II LSRW SKILLS & GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 9

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 & Vocabulary (Function Grammar & Technical Vocabulary**)

Modal verbs – Conjunction - Expression of cause and effect. Phrasal verbs - Idioms.

UNIT – III LSRW SKILLS & GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 9

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 & Vocabulary (Function Grammar & Technical Vocabulary)

Active and Passive voice - Purpose expression. Same words used as noun and verb - Often misspelt and confused words.

UNIT-IV LSRW SKILLS & GRAMMAR, CAREER ORIENTED

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 9

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** – Checklist preparation.

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Grammar - Numerical expressions – Collocations. Singular and Plural (Nouns)

UNIT- V LSRW SKILLS & GRAMMAR, FIELD WORK

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 9

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 & Vocabulary (Function Grammar & Technical Vocabulary)

Transformation of sentences (Simple, Compound & Complex).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

TEXT BOOK:

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

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF 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 :

www.learnerstv.com – Listening/ Speaking/ Presentation

www.usingenglish.com – Writing/ Grammar

www.englishclub.com – Vocabulary Enrichment/ Speaking

www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking

www.teachertube.com – Writing Technically

www.Dictionary.com – Semantic / Grammar

17BECC202 ENGINEERING MATHEMATICS- II L T P C 3 2 0 4

Course Objectives:

1. To have knowledge in integral calculus.
2. Determine mathematical tools needed in evaluating multiple integrals and their usage.
3. Utilize Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.
4. Apply the knowledge of Mathematics in various Engineering fields by making them to identify the functions in engineering problems as analytic function and their analyze as a function of a complex variables.
5. Develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, to specify some difficult integration that appear in applications can be solved by complex integration in application areas such as fluid dynamics and flow of the electric current.
6. To learn Basic concepts of multiple and vector integrals.

Course Outcomes:

The student will be able to

1. The student will be able to solve problems in Fluid Dynamics, Theory of Elasticity, Heat and Mass Transfer etc.
2. The students will be able to understand mathematical tools needed to evaluate the areas and volumes using multiple integrals.
3. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage. Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.
4. To find the Analytic functions using the Cauchy Riemann equations and they will learn mapping properties of elementary functions and mapping properties of some special transcendental functions.
5. Students will understand relations between conformal mappings and quadratic differentials and how geometric structures are changing under conformal mappings.
6. To evaluate complex integrals using the Cauchy integral formula and the residue Theorem and to appreciate how complex methods can be used to prove some important theoretical results.

UNIT I INTEGRAL CALCULUS 12

Definite and indefinite integrals – Techniques of integration – Substitution rule, Trigonometric integrals, Integration by parts , Integration of rational functions by partial fraction, Integration of irrational functions – Improper Integrals.

UNIT II MULTIPLE INTEGRALS 12

Double integral – Cartesian coordinates – Polar coordinates – Area as double integrals- Change the

order of integration – Triple integration in Cartesian co-ordinates.

UNIT III VECTOR INTEGRATION **12**

Integration of vectors – line integral- surface integral- volume integral- Green‟s theorem - Gauss divergence theorem and Stoke‟s theorems (Statement Only), hemisphere and rectangular parallelopipeds problems.

UNIT IV ANALYTIC FUNCTIONS **12**

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 **12**

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).

TOTAL: 60 HOURS

TEXT BOOKS:

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

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Erwin Kreyszig	Advanced Engineering Mathematics.	John Wiley & Sons. Singapore	2011

2	Venkataraman, M. K.	Engineering Mathematics.	The National Publishing Company, Chennai	2005
3	Narayanan. S, Manicavachagam pillay.T.K and Ramaniah.G	Advanced Mathematics for Engineering Students.	Viswanathan S.(Printers and Publishers) Pvt. Ltd. Chennai.	2002
4	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES:

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

17BEPH203 ENGINEERING PHYSICS L T P C 3 0 0 3

Course Objectives:

- To understand the properties of matter and thermodynamics with its applications.
- To introduce the concepts of light, laser and fiber optics for diverse applications.
- To study the fundamentals of quantum physics and their applications.
- To comprehend the properties of crystal and its various crystal structures.
- To study the basics of sound and ultrasonics with appropriate applications.
- To inculcate the characteristics of electronic materials through basics.

Course Outcomes

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

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

UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS 9

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), Poisson‟s ratio- Torsional pendulum- bending of beams - bending moment – uniform and non uniform bending

Thermodynamics – laws of thermodynamics- concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS 9

Introduction – emission and absorption process- Einstein‟s coefficients derivation. Types of LASER - CO_2, 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 9

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

UNIT IV CRYSTAL PHYSICS **9**

Lattice – unit cell – Bravais lattice – 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 **9**

– 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, 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-641 001	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF 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
5	**P. Khare, A. Swarup**	Engineering Physics: Fundamentals and Modern Applications	Jones & Bartlett Learning	2009

WEBSITES:

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

17BECH203 ENGINEERING CHEMISTRY L T P C 3 0 0

Course Objectives:

1. To make the students conversant with basics of water technology.
2. To make the student acquire sound knowledge of electrochemistry and storage devices.
3. To acquaint the student with concepts of fuels and combustion.
4. To develop an understanding of the basic concepts of corrosion science.
5. To acquaint the students with the basics of surface chemistry.
6. To comprehend the basic organic chemistry and to synthesis simple drug.

Course Outcomes

Upon completion of the course the students will be able to

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

UNIT I WATER TECHNOLOGY 9

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination (No problems) – Hardness – Types and estimation by EDTA method (No 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 9

Electrolytic conductance-application (conductometric titration)- 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) –- Batteries- Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELS AND COMBUSTION 9

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- Problems on Calculation of GCV & NCV - Flue gas analysis.

UNIT IV CORROSION SCIENCE **9**

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 of Cu over Fe and Electro less plating (Ni) - Surface conversion coating - Hot dipping.- Anodizing of Al

UNIT V SURFACE CHEMISTRY AND PHASE RULE **9**

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

TEXT BOOKS:

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

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., 3rd Reprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010

3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
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

17BECC204 ENVIRONMENTAL SCIENCES L T P C 3 0 0 3

Course Objectives:

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

Course Outcomes (COs)

Upon completion of the course the students will be able to

1. Recognize the importance of natural resources (S).
2. Associate themselves with the various ecosystems (S).
3. Describe the importance of biodiversity (S).
4. Identify and minimize the difference pollutions (S).
5. Prioritize and analyses the social issues (S).
6. Integrate the environmental principles in the projects undertaken in field of engineering and technology (A).

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

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 9

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 9

Introduction to biodiversity, Definition- Geneticdiversity, Species diversity and Ecosystem diversity,

Biogeographical 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 **9**

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 **9**

From Unsustainable to Sustainable development, Urban problems related to energy sources, 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

TEXT BOOKS:

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Ravikrishnan, A	Environmental Science	Sri Krishna Hi tech Publishing Company Private Ltd., Chennai	2012
2.	Anubha kaushik C.P. Kaushik	Environmental Science and Engineering	New Age International (P) Ltd., New Delhi.	2010

REFERENCES:

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William P.Cunningham	Principles of Environmental Science	Tata Mc Graw -Hill Publishing Company, New Delhi.	2008
2.	Linda D. Williams	Environmental Science Demystified	Tata Mc Graw -Hill Publishing Company Ltd., New Delhi.	2005
3.	Bharucha Erach	Environmental	Mapin Publishing (P) Ltd.,	2005
		Science Demystified	Ahmedabad.	
4.	Tyler Miller G. Jr	Environmental Science	Thomson & Thomson Publishers, New Delhi.	2004
5.	Trivedi, R.K. and Goel, P.K	Introduction to Air Pollution	Techno-Science Publications, Jaipur.	2003

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/

17BEEE205 ANALYSIS OF ELECTRIC CIRCUITS L T P C 3 2 0 4

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

UNIT I BASIC CIRCUITS ANALYSIS 12

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 12

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 12

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 12

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

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

17BEPH211 ENGINEERING PHYSICS LABORATORY L T P C 0 0 4 2

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

17BECH211 ENGINEERING CHEMISTRY LABORATORY L T P C 0 0 4 2

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

1. The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
2.Estimate the amount of alkalinity ions, hardness, chloride in water sample
3.Measure molecular/system properties of conductance of solutions, EMF etc
4.Acquaint the students with the determination of molecular weight of a polymer by visocometry
5.Determine the corrosion rate of steel by weight loss method.
6.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 SO_4.
8. pH Titration (acid & base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$).
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.

17BEEE212 ELECTRIC CIRCUITS LABORATORY L T P C 0 0 3 2

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 analyse 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

1. To understand and analyze basic electric circuits.
2. Getting basic practical knowledge about the DC Electric circuits.
3. Getting knowledge about the testing of different network theorems using simple circuits.
4. To introduce basic electrical equipments in the lab
5. To enable the students to analysis the basic laws using simple circuits.
6. 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.

17BEEE213 ENGINEERING GRAPHICS L T P C 1 0 3 3

Course Objectives

- 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:

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design
3. Exposure to the visual aspects of engineering graphics standards
4. Exposure to solid modeling and computer-aided geometric design .
5. Exposure to creating working drawings and engineering communication
6. Exposure to known about projection of solids

UNIT I INTRODUCTION 9

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.

UNIT II SCALES AND PLANE CURVES 8

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 9

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 8

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 8

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) **3**

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: 45 HOURS

Section 5.01 TEXT BOOKS

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

Section 5.02 REFERENCES

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

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.

17BECC251* **BUSINESS PLAN** **L T P C 1 0 0 –**

Course Objectives

- To explain relevance of Ethics while taking business decisions.
- To get knowledge of Entrepreneurship
- To get knowledge of business plan process
- To get knowledge of business plan components
- To learn about management and organization
- To study about government policy

Course Outcomes

- Todevelop a business plan connected with ethics.
- To become Entrepreneur
- To analysis business plan process
- To analysis business plan components
- To build up management and organization plan
- To implement government policy

Unit I

Entrepreneurship – Types- Entrepreneurial Competencies -Business Plan – Meaning - Basic parameters - Project parameters - Factors of successful business - Term Loans and Working Capital Management.

Unit II

Business Plan Process - Sources of Information – Online Resources - Offline Resources - Sources of Market Research - Benefits of market study - Coverage of market study.

Unit III

Business Plan components - Company description - Industry Analysis - Target Market - Competition - Strategic position - Risk assessment - Technology plan - Management and Organization – Government policy

Section 5.03 REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rhonda Abrams	The Successful business Plan Secret $ Strategies	Prentice Hall	-
2	Rhonda Abrams	Quantitative Aptitude for Competitive Examinations	Prentice Hall	-

3	-	Business plan preparation	Entrepreneurship Development Institute of India	-

SEMESTER III

17BEEE301A METHODS OF APPLIED MATHEMATICS L T P C 3 2 0 4

Course Objectives:

- To make the student understand the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems and also to acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- Some standard functions and some of the properties of the Fourier transform.
- Study Partial Differential equations in gravitation, electromagnetism, perfect fluids, elasticity, heat transfer and quantum mechanics.
- To study the difference equations
- To develop the use of Z - Transform techniques which is needed by Engineers for practical applications.

Course Outcomes:

Upon Completion of this course the students will be ableto:

1. Apply Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.
2. To solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
3. To be able to solve equations using Fourier transform
4. Better understanding in problems related to heat condition, communication systems, electro optics and electromagnetic theory using the techniques will be learnt in this course.
5. To solve problems using Z -Transform techniques for discrete time systems.
6. Apply the concept of Laplace, Fourier, Z- Transforms, Fourier Series and Applications of Partial Differential Equations in Engineering field.

UNIT- I LAPLACE TRANSFORM 13

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 12

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 12

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 11

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

TOTAL: 60 HOURS

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of 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:

S. No.	Author(s) Name	Title of the book	Publisher	Year of 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	Tata Mc Graw Hill Publishing Co. Ltd. New Delhi.	2008

WEBSITES

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

17BEEE301B LINEAR ALGEBRA AND SPECIAL FUNCTIONS L T P C 3 2 0 4

Course Objectives:

1. To introduce the basic notions of groups, rings, fields which will then be used to solve related problems.
2. To understand the concepts of vector space, linear transformations and diagonalization.
3. To apply the concept of inner product spaces in orthogonalization.
4. To understand the concept of Hyperbolic, Beta and Gamma Functions.
5. To solving Bessel functions of the first kind and their properties.
6. To study the Bessel function

Course Outcomes:

1. Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
2. Demonstrate accurate and efficient use of advanced algebraic techniques.
3. Demonstrate their mastery by solving non - trivial problems related to the concepts and by proving simple theorems about the statements proven by the text.
4. Be able to acquire basic knowledge on vector spaces and linear transformations.
5. To apply various techniques in solving differential equations and to understand the method of finding the series solution of Bessel's differential equations.
6. Be able to build and solve the special functions.

UNIT I VECTOR SPACES 12

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 12

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

UNIT III INNER PRODUCT SPACES 12

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

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 12

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	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dr. Grewal B.S.	Higher Engineering Mathematics	Khanna Publishers, New Delhi.	2013
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

17BEEE302 ELECTRICAL MACHINES- I L T P C 3 0 0 3

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 no- load/load characteristics, starting and methods of speed control of motors.
- To estimate various losses taking place in D . C . Motor
- To s t u d y t h e different testing methods to arrive at their performance.

Course Outcomes (COs)

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. Analyse the differences in operation of different dc machine configurations.
5. Analyse the single phase transformers circuits.
6. Analyse the three phase transformers circuits.

UNIT I DC GENERATORS 9

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

UNIT II DC MOTORS 9

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

UNIT III TESTING OF DC MACHINES 9

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

UNIT IV SINGLE PHASE TRANSFORMER 9

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 **9**

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

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	2015

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sen S.K	Electric Machinery	Khanna Publishers, New Delhi	2010
2	Say M.G	Alternating Current Machines	Pitman Publishing	2010
3	Irving. L. Kosow	Electrical Machines and Transformers	PHI, 2 nd Edition	2011
4	Theraja B.L. and Theraja A.K	A Text Book of Electrical Technology	Vol. II, S.Chand & Co. Ltd., New Delhi	2010
5	Bimbhra P.S	Electrical Machinery	Khanna Publishers, New Delhi	2012

WEBSITE

1. http://nptel.iitm.ac.in/courses/IIT–MADRAS/Electrical_Machines_I/index.php

17BEEE303 ELECTROMAGNETIC THEORY L T P C 3 0 0

3 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 (COs)

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 analyse 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 9

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

UNIT II ELECTROSTATICS 9

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 9

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.

UNIT IV ELECTRODYNAMIC FIELDS 9

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 HOURS

TEXTBOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	William H. Hayt	Engineering Electromagnetics	Tata McGraw Hill, New Delhi	2014

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	2010
2	Kraus and Fleish	Electromagnetics with Applications	5th edition, McGraw Hill international edition	2010
3	Sadiku	Elements of electromagnetics	6thedition, oxford university press	2014
4	Joseph Edminister	Schaum‟s outline of electromagnetic	4th 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

3 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 9

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 9

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 9

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 S P E C I A L DEVICES 9

Construction and operation: 7-Segment Display, tunnel diode and laser diode, UJT, thermistors, piezo electric devices, MOSFETS – FET as a variable resistor.

UNIT V OSCILLATORS AND PULSE CIRCUITS 9

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

TOTAL: 45 HOURS

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.	2010
2	Allen Mottershead	Electronic Devices and Circuits – An Introduction	Prentice Hall of India Private Limited, New Delhi.	2011
3	David A. Bell	Electronic Devices and Circuits	Prentice Hall of India, New Delhi.	2010

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	2012
2	Jacob Millman & Herbert Taub	Pulse, Digital & Switching Waveforms	Tata McGraw Hill	2013
3	Donald L.Schilling and Charles Belove	Electronic Circuits	Tata McGraw Hill	2011

17BEEE305A RENEWABLE ENERGY SOURCES L T P C 3 0 0 3

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 theUS,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 9

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 9

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 9

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 9

Hydropower, classification of hydropower, 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 **9**

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

TOTAL: 45 HOURS

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	2011

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. & Parulekar	Energy Technology	Khanna publishers, Fourth edition	2012
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	2010

WEBSITES

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

17BEEE305B POWER PLANT ENGINEERING L T P C 3 0 0 3

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 instrumenation available in the plant
4. Demonstrate the monitorin control in the plant
5. Analyse the various cost arrivals for various TARIFF consumers
6. Anlysis the real time application of it.

UNIT I ECONOMICS OF POWER GENERATION 9

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 9

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 9

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 9

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 9

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

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	2010

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 14th 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

17BEEE311 ELECTRICAL MACHINES- I LABORATORY L T P C 0 0 3 2

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 analyse 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 knowledeg of commercial system energy calculations

LIST OF EXPERIMENTS

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.

17BEEE312 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

LIST OF EXPERIMENTS

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.

17BEEE313 BASIC SIMULATION LABORATORY FOR ELECTRICAL SYSTEMS

L T P C 0 0 3 2

Course Objectives

- 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

LIST OF EXPERIMENTS

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.

17BEEE351* INTRODUCTION TO SOLAR PV DESIGN L T P C 1 0 0 –

Course Objectives
Students will

- 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
- Ariving 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	2012
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 Installation Manual	-	-

17BEEE351A* **INTRODUCTION TO IOT** **L T P C 1 0 0 –**

Course Objectives

- To learn about Embedded system.
- To learn about IOT
- To learn about technologies in IOT
- To get knowledge about standards and tools of IOT
- To study case studies about IOT
- To study the application of it

Course Outcomes

- Understand the basics of Embedded System, IoT and the development model
- Apply the tools, techniques and skills acquires towards development of projects
- Understand the Internet of Things Standards and Frameworks
- Understand the 252 IT-2013 SRM (E&T)Techniques
- Analysis the real time application
- Analysis the case studies of IOT

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS AND INTERNET OF THINGS (IOT)

Architecture of Embedded Systems- Embedded Systems Development process- Architecture of Internet of Things- Applications of Embedded Systems and IoT-Challenges in designing an Embedded System

UNIT II - IOT: TECHNOLOGIES, STANDARDS AND TOOLS

Fundamental characteristics and high level requirements of IoT- IoT Reference model-IoT ecosystem and Business models- Introduction to Protocols of IoT: D2D, D2S, S2S- Comparison between MQTT, CoAP, LWM2M, ETSI M2M- Introduction to simulation tools.

UNIT III CASE STUDIES AND APPLICATION DEVELOPMENT FOR IOT USING EMBEDDED SYSTEMS

Smart cities-Smart environment-Smart Water- Smart metering- Security and emergencies-Smart agriculture-Techniques for writing Embedded code - Examples for Application development for IoT.

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Dr.K.V.K.K.Prasad	Embedded Real Time Systems: Concepts, Design and Programming‖	DreamTech Publication	2003
2	John Balfour, Michael Shaw	Designing the Internet of Things‖	Adrian McEwen, Hakim Cassimally	2012

3	-	The Internet of Things: Key applications and Protocols‖	Wiley Publications 2nd Edition	-

SEMESTER IV

17BEEE401 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. Analyse 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 12

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 12

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 12

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 12

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 12

Construction and Principle of operation of single phase induction motor- Double revolving field

theory –Methods of starting – types- Applications.

TOTAL: 60 HOURS

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	2015
2.	Theraja B. L and Theraja A. K	A Textbook of Electrical Technology	S Chand & Co. Ltd., New Delhi	2010

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	2015
2	Langsdorf A. S	Theory of A.C Machinery	Tata McGraw Hill	2011
3	Sen. S. K	Electric Machinery	Khanna Publishers, New Delhi,	2010
5	Bimbhra P.S	Electrical Machinery	Khanna Publishers, New Delhi	2012

WEBSITES

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

17BEEE402 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 analyse 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 12

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 12

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 neighboring 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, load ability 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 **12**

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, breaker-and-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

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Hadi Saadat	Power System Analysis	Tata McGraw Hill Publishing, New Delhi Company	2010
2	Central Electricity Authority (CEA)	Guidelines for Transmission System Planning	Tamil Nadu Electricity Board	2013
3	Colin Bayliss and Brian Hardy	Transmission and Distribution Electrical Engineering	Elsevier, Newnes	2012

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gupta. B. R	System Analysis and Design	S.Chand, New Delhi	2013
2	V.K.Metha Rohit Metha	Principles of power system	S.Chand & co, New Delhi	2010
2	Singh, S. N	Electric Power Generation, Transmission and Distribution	Prentice Hall of India Pvt. Ltd, New Delhi	2012

WEBSITE

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

17BEEE403A MEASUREMENTS AND INSTRUMENTATION L T P C 3 0 0 3

Course Objectives

- 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

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

UNIT I INTRODUCTION 9

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 9

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 9

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 9

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

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UNIT V VIRTUAL INSTRUMENTATION **9**

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

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.	2013
2	Sawhney. A. K.	A Course in Electrical and Electronic Measurements and Instrumentation	Dhanpat Rai and Co., New Delhi.	2011
3	Sanjay Gupta and Joseph John	Virtual Instrumentation using LabVIEW	Tata McGraw Hill Publishing Company Ltd., 2nd Edition	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Moorthy. D. V. S.	Transducers and Instrumentation	Prentice Hall of India Pvt. Ltd, New Delhi.	2010
2	Martin Reissland	Electrical Measurements	New Age International (P) Ltd., Delhi.	2011
3	Gupta, J. B	A Course in Electronic and Electrical Measurements	S. K. Kataria and Sons, Delhi.	2012
4	Gary. W. Johnson and Richard	LabVIEW Graphical Programming	Tata McGraw Hill Publications, New York.	2011

WEBSITES

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

17BEEE403B TRANSDUCER ENGINEERING L T P C 3 0 0 3

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 9

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 9

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 9

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.

UNIT V OTHER TRANSDUCERS 9

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	2012
2	A.K. Sawhney	A course in Electrical & Electronic Measurement and Instrumentation	Dhanpat Rai and Co (P) Ltd	2015

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	2003
2	John P. Bentley	Principles of Measurement Systems	Pearson Education	2005
3	D.V.S Murthy	Transducers and Instrumentation	Prentice Hall of India	2008
4	Al Sutko and J.D. Faulk	Industrial Instrumentation	Vikas Publications Delhi	2005

17BEEE404 LINEAR INTEGRATED CIRCUITS L T P C 3 0 0 3

Course Objectives

- To study the IC fabrication procedure.
- To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
- To study the applications of Op-amp.
- To study internal functional blocks and the applications of special ICs like Timers,
- To study PLL circuits, regulator Circuits, ADCs.
- To get the knowledge of recent development in it

Course Outcomes

- Ability to understand and analyse, linear and digital electronic circuits.
- Understand the IC fabrication procedure.
- Understand the characteristics; realize circuits; design for signal analysis using Op- amp ICs.
- Analysis the applications of Op-amp.
- Analysis the internal functional blocks and the applications of special ICs like Timers,
- Analysi the real time time application of PLL circuits, regulator Circuits, ADCs.

UNIT I IC FABRICATION **9**

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

UNIT II CHARACTERISTICS OF OP-AMP **9**

Ideal OP-AMP characteristics, DC characteristics, AC characteristics,, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting Amplifiers-V/I & I/V converters ,summer, differentiator and integrator.

UNIT III APPLICATIONS OF OP-AMP **9**

Instrumentation amplifier, Log and Antilog Amplifiers, first and second order active filters, , comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R- 2R ladder and weighted resistor types), A/D converters using op-amps.

UNIT IV SPECIAL ICs **9**

Functional block, characteristics & application circuits with 555 Timer Ic-566 voltage controlled oscillator Ic; 565-phase lock loop Ic ,Analog multiplier ICs.

UNIT V APPLICATION ICs **9**

IC voltage regulators –LM78XX,79XX Fixed voltage regulators - LM317, 723 Variable voltage regulators, switching regulator- SMPS- LM 380 power amplifier- ICL 8038 function generator IC.

TOTAL : 45 PERIODS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	David A.Bell	Op-amp & Linear ICs	Oxford	2010
2	D.Roy Choudhary, Sheil B.Jani	Linear Integrated Circuits	New Age	2003
3	Ramakant A.Gayakward	Op-amps and Linear Integrated Circuits	Pearson Education	2003

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Fireo	Opamps & Linear Integrated Circuits Concepts & Applications	Cengage	2003
2	Floyd ,Buchla	Fundamentals of Analog Circuits	Pearson	2013
3	Jacob Millman, Christos C.Halkias	Integrated Electronics - Analog and Digital circuits system	Tata McGraw Hill	2003
4	Robert F.Coughlin, Fredrick F. Driscoll	Op-amp and Linear ICs	PHI Learning, 6th edition	2012

17BEEE405A BASIC THERMODYNAMICS AND ENERGY CONVERSION DEVICES

L T P C 3 0 0 3

Course Objectives

Students will learn

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

Course Outcomes

- To impart the basic knowledge of various basic fields of mechanical engineering.
- To Study about basic manufacturing processes.
- To study about basic machining process.
- To study about power plants.
- To study about automobile engineering
- To understand the application of it.

UNIT I BASIC CONCEPTS AND FIRST LAW 9

Basic concepts - Classical and Statistical approaches - Thermodynamic systems - closed, open, isolated. Property – State - Process-adiabatic - Quasi-static process – Cycle - Point and Path function – Energy - Work transfer - Concept of temperature and heat- Zeroth law of thermodynamics - Concept of ideal gases - First law of thermodynamics –PMM1, internal energy, specific heat capacities, enthalpy, and its application to closed system and open system-steady flow energy equation.

UNIT II SECOND LAW AND ENTROPY 9

Physical description of the second law - Kelvin-Planck and Clausius statements –Equivalence - Reversible processes and cycles- Carnot cycle – Corollaries - Absolute temperature scale – Clausius Theorem, inequality - Entropy- Principle, transfer, generation, balance - Third law of thermodynamics

UNIT III HEAT TRANSFER 9

One-dimensional Heat Conduction in cartesian coordinate system : Plane wall – Cylinder - Composite walls –Heat transfer through extended surfaces (simple fins). Convection: Free convection and forced convection - Internal and external flow. Radiation: Black–Gray bodies - Cooling of electronic components: Thermoelectric cooling – Chip cooling.

UNIT IV REFRIGERATION 9

Study of household refrigerator, window air conditioner, split air conditioner Ratings and selection criteria of above devices. Refrigerants and their impact on environment.

UNIT V ENERGY CONVERSION DEVICES (Theoretical study using schematic diagrams only) **9**

Boiler – Fire tube boiler, Water tube boiler, Turbine -Impulse & Reaction turbine, Hydraulic turbines - Pelton wheel, Francis turbine and Kaplan turbine. I.C. engines – Working of two stroke, four stroke, spark ignition and compression ignition engines. Pumps – positive and non positive displacement pump.

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nag P K	Engineering Thermodynamics	Tata McGraw-Hill, New Delhi	1998
2	Sachdeva R.C	Fundamentals of Engineering Heat and Mass Transfer	New Age International, New Delhi	2010
3	Arora C.P	Refrigeration and Air conditioning	Tata McGraw–Hill, New Delhi	2010

17BEEE405B ENGINEERING MATERIALS L T P C 3 0 0 3

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 9

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 9

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 9

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 9

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

UNIT V POLYMERS AND COMPOSITES 9

Microstructural features of polymers and composites - Mechanical behaviour of polymers and composites - Production, forming, and joining of polymers and composites.

TOTAL: 45 HOURS

Section 5.04 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

Section 5.05 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

WEB REFERENCES

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

17BEEE411 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 componenets in alternators
- To study the importatnce need of ZPF methods

Course Outcomes (COs)

1. Compare the different indirect testing methods to predetermine the voltage regulation of three phase 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 condition
4. Assess the performance of three phase induction motor by conducting direct and indirect testing
5. Assess the performance of single phase induction motor by conducting direct and indirect testing
6. Choose the appropriate induction motor starter for various industrial and commercial applications

LIST OF EXPERIMENTS

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

17BEEE412 SCIENTIFIC COMPUTING LABORATORY L T P C 2 0 2 3

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:

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

LIST OF EXPERIMENTS

1. 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. Solution of algebraic simultaneous equations
   - i) Gauss Jacobi method
   - ii) Gauss Seidel 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 4^{th} 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. No.	Author(s) Name	Title of the book	Publisher	Year of 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

17BEEE413 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 (COs)

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

1.Train the students in the measurement of displacement, resistance, inductance, torque and angle etc.,
2.Give exposure to ac, dc bridges
3.Give knowledge on transient measurement.
4.Understand the procedure and usage of instruments
5.Acquire knowledge of principle of calibration of a measuring instrument and Plotting of calibration curves
6.Acquire hand-on experience on measurement of parameters and verification of Laws of illumination

LIST OF EXPERIMENTS

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.

17BEEE451* **ELECTRICITY STANDARDS** **L T P C 1 0 0 –**

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	McGraw-Hill Education; 16th edition	2012

SEMESTER V

17BEEE501 POWER ELECTRONICS L T P C 3 0 0

3 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.Analyse controlled rectifier circuits.
4.Analyse the operation of DC-DC choppers.
5.Analyse the operation of voltage source inverters.
6.Understand different modulation techniques.

UNIT I POWER SEMI CONDUCTOR DEVICES 9

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 9

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 9

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 9

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).

UNIT V AC-AC CONVERTER AND APPLICATIONS **9**

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.

TOTAL: 45 HOURS

TEXT BOOKS

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	2013
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	2011

REFERENCES

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

WEBSITE

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

17BEEE502 DIGITAL LOGIC CIRCUITS L T P C 3 0 0 3

Course Objectives

- To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- To familiarize with the design of various combinational digital circuits using logic gates
- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- To study the design of an asynchronous sequential circuit and describe the race conditions, hazards and errors in digital circuits
- To explain the various semiconductor memories and related technology
- To introduce the electronic circuits involved in the making of logic gates

Course Outcomes

At the end of this course, students will demonstrate the ability to
1.Use numerical methods to analyse 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 NUMBER SYSTEM AND BOOLEAN ALGEBRA 9

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 II COMBINATIONAL CIRCUITS 9

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

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits – Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUIT 9

Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

UNIT V PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC FAMILIES 9

Memories: RAM, ROM, PROM, EPROM, EEPROM, PLA, PAL, PLD, FPGA, and Digital logic families. GATE implementations.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Raj Kamal	Digital systems-Principles and Design	Pearson Education 2nd edition	2007
2	M. Morris Mano	Digital Design with an introduction to the VHDL	Pearson Education	2013
3	Comer	Digital Logic & State Machine Design	Oxford	2012

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mandal	Digital Electronics Principles & Application	Tata McGraw Hill Publications,	2013
2	William Keitz	Digital Electronics-A Practical Approach with VHDL	Pearson	2013
3	Anand Kumar	Fundamentals of Digital Circuits	PHI	2013

17BEEE503 CONTROL SYSTEM ENGINEERING L T P C 3 2 0 4

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 12

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 12

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 12

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 **12**

Realization of basic compensators – cascade compensation in time domain and frequency domain 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 tacho generator – AC tacho generator – Hydraulic controller – Pneumatic controller – Typical application of control system in industry.

TOTAL: 60 HOURS

TEXT BOOKS

S.NO.	Author(s) Name	Title of the Book	Publisher	Year of publication
1	Ogata.K	Modern Control Engineering	Prentice Hall of India,5th Edition	2015
2	Nagrath & Gopal	Control System Engineering	New Age International Edition, 6th Edition ,	2017

REFERENCES

S.NO.	Author(s) Name	Title of the Book	Publisher	Year of publication
1	Benjamin.C.Kuo Farid Golnaraghi	Automatic Control Systems	Prentice Hall of India,9th Edition New Delhi	2014
2	Norman S. Nise	Control System Engineering	Wiley Publication, 6th edition	2012
3	Richard C.Dorf Robert H.Bishop	Modern Control Systems	Prentice Hall of India,12th Edition New	2011

17BEEE511 POWER ELECTRONICS LABORATORY L T P C 0 0 3 2

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 (COs)

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

17BEEE512 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 undersatnd the Boolen 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.

17BEEE513 CONTROL SYSTEM ENGINEERING LAB0RATORY L T P C 0 0 3 2

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)

1. Determine the transfer function of DC Shunt Motor.
2. Ability to find the frequency response of different compensators
3. Ability to find the step response of P Controller.
4. Ability to find the step response of PI & PID Controller.
5. Ability to identify the type of damping from the given Characteristic equation.
6. 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.

17BEEE552A* CONTROL AND MAINTENANCE FOR ELECTRICAL MOTORS

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.

17BEEE552B* PROGRAMMABLE LOGIC CONTROLLER (PLC) L T P C 1 0 0 –

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

17BEEE601 SOLID STATE DRIVES L T P C 3 0 0 3

Course Objectives

- To study and understand the operation of electric drives controlled from a power electronic converter and to introduce the design concepts of controllers.
- To understand the stable steady–state operation and transient dynamics of a motor–load system.
- To study and analyze the operation of the converter/chopper fed dc drive and to solve simple problems.
- To study and understand the operation of both classical and modern induction motor drives.
- To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.
- 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
- understand the concept of drive characteristics and various converters used for drives.
- understand the operation of electric drives controlled from a power electronic converter.

understand the stable steady–state operation and transient dynamics of a motor–load system.

- analyze the operation of the converter/chopper fed dc drive and to solve simple problems.
- Understand the operation of both classical and modern induction motor drives.
- 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 9

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 9

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 9

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.

UNIT IV SYNCHROUNOUS MOTOR DRIVES 9

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 CONTROLLER FOR DRIVES **9**

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.

TEXT BOOKS **TOTAL: 45 HOURS**

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gopal K Dubey	Fundamentals of Electric Drive	Narosa Publishing house, II Edition	2011
2	B.K Bose	Modern Power Electronics and AC Drives	Pearson Education, 3rd Reprint	2003

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 3rd edition	2014

WEBSITE

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

17BEEE602 POWER SYSTEM ANALYSIS L T P C 3 2 0 4

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 analyse power systems under abnormal (fault) conditions.
- To model and analyse 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 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 12

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 12

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 UNBALANCED FAULT 12

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 12

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

Long 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. No.	Author(s) Name	Title of the Book	Publisher	Year of 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. No.	Author(s) Name	Title of the Book	Publisher	Year of 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

17BEEE603A MICROPROCESSOR AND MICROCONTROLLER L T P C 3 0 0 3

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

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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, interupts 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 9

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

UNIT II INSTRUCTION SETS 9

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

UNIT III PERIPHERAL INTERFACING 9

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 9

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

UNIT V ADVANCED PROCESSORS 9

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

TOTAL: 45 HOURS

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.	2013
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–Perez and Ramon Pallas–Areny	Microcontrollers: Fundamentals and Applications with PIC	CRC , Colorado, USA	2009
2	William Routt	Microprocessor Architecture, Programming and Systems Featuring the 8085	Delmar Cengage Learning, New York	2010
3	David Calcutt, Frederick Cowan, and Hassan Parchizadeh	8051 Microcontrollers: An Applications Based Introduction	Newnes, United States	2004
4	John B. Peatman	Design with PIC Microcontrollers	Pearson Education, Asia	2004
5	Hamid A. Toliyat, Steven Campbell	DSP based Electromechanical Motion Control	CRC Press, USA	2003

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

17BEEE603B MICROCONTROLLER BASED SYSTEM DESIGN L T P C 3 0 0 3

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, interupts 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
- To analyse the real time application of it.
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UNIT I 8051 ARCHITECTURE 9

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

UNIT II 8051 PROGRAMMING 9

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 9

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

UNIT IV PERIPHERAL OF PIC MICROCONTROLLER 9

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 9

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

TEXT BOOKS

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

REFERENCES

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

17BEEE604 DESIGN OF ELECTRICAL APPARATUS L T P C 3 0 0 3

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 9

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 9

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 9

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.

UNIT V SYNCHRONOUS MACHINES 9

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	Mittle V.M. and Mittle.A	Design of Electrical Machines	Standard publishers Distribution	2002
2	Sawhney, A.K	A course in Electrical Machine Design	Dhanpat rai & sons	2006
3	Sen, S.K	Principles of Electrical Machine Design with Computer Programs	Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi	2006

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	1st edition, Wiley-IEEE Press.	2004

WEBSITES

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

17BEEE611 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 understand the basic architecture of microcontroller.
- To study about interfacing system.

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”.

17BEEE612 ELECTRICAL ESTIMATION AND REWINDING LABORATORY

L T P C 0 0 3 2

To be able to deal with motor rewinding and transformer winding connections.

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.

17BEEE651* PCB DESIGN AND SERVICING OF DOMESTIC APPLIANCES

L T P C 1 0 0 –

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

17BECC701 PROFESSIONAL ETHICS, PRINCIPLE OF MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT L T P C 3 0 0 3

SECTION 5.06 Course Objectives

- 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 9

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 9

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 9

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 9

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

UNIT V ENTREPRENEURSHIP AND MOTIVATION 9

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

TEXT BOOKS

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., New Delhi	2006
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, New York	2005

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

17BEEE702 POWER SYSTEM PROTECTION AND SWITCHGEAR L T P C 3 0 0 3

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 9

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 9

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 9

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 9

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.

UNIT V CIRCUIT BREAKERS 9

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

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 2nd Edition	2011
2	Badri Ram and Vishwakarma, D.N.	Power System Protection and Switchgear	Tata McGraw hill, New Delhi.	2011

REFERENCES

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

WEBSITES

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

17BEEE711 POWER SYSTEM SIMULATION LABORATORY L T P C 0 0 3 2

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 impedence and admittance matrix.
- A network under symmetrical fault conditions and interpret the results

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Course Outcomes (COs)

1. Apply load flow analysis to an electrical power network and interpret the results using Gauss-Seidel and Newton Raphson Methods.
2. Apply load flow analysis to an electrical power network and interpret the results using Fast-Decoupled Methods.
3. Explain the transient stability analysis of single and multi machine infinite bus system
4. Examine the electromagnetic transients and its impact in power system studies
5. Evaluate the frequency dynamics, economic dispatch of single and two area power systems.
6. 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.

17BEEE751* **ETAP AND PSCAD** **L T P C 1 0 0 –**

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

17BEEE801A 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 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 9

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 9

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 9

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 9

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.

UNIT V BASIC PRINCIPLES OF ENERGY AUDIT **9**

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 Electrical Energy	Dhanpat Rai and Co, New Delhi	2004
2	C.L. Wadhwa	Generation, Distribution and Utilization of Electrical Energy	New Age International Pvt.Ltd	2003
3	J.B. Gupta	Utilization of Electric Power and Electric Traction	S.K.Kataria and Sons	2002

17BEEE801B SMART GRID L T P C 3 0 0 3

Course Objectives

- 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 II SMART GRID: MODELS AND OPERATING PRINCIPLES 9

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 9

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 9

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 Publication
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 , Grzegorz Pawel Benysek	Power Electronics in Smart Electrical Energy Networks	Springer, USA	2008
5	Hendrik C. Ferreira ,Lutz Lampe , John Newbury,Theo G Swart	Power Line Communications: Theory and Applications for Narrowband and Broadband Communications over Power Lines	Wiley, New York	2010

WEBSITES

1. www.wca.org
2. www.sandc.com

LIST OF DEPARTMENT ELECTIVES

ELECTIVE – I (ONLY APPLICABLE FOR FIFTH SEMESTER)

17BEEE5E01 NETWORK ANALYSIS AND SYNTHESIS L T P C 3 0 0 3

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.

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. Analyse the electrical circuits using Laplace Transforms.
4. Obtain the transient and steady-state response of electrical circuits.
5. Analyse circuits in the sinusoidal steady-state (single-phase and three-phase).
6. Analyse two port circuit behavior.

UNIT-I INTRODUCTION 9

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 9

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.

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

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 9

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 9

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

TEXT BOOKS

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

REFERENCES

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

17BEEE5E02 ADVANCED CONTROL SYSTEM L T P C 3 0 0

3 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 9

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 9

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

UNIT 1V STATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEM 9

State equation – Solutions – Realization – Controllability – Observability – Stability – Jury's test.

UNIT V OPTIMAL CONTROL 9

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

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of 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

REFERENCES

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

17BEEE5E03 ELECTRIC HYBRID VEHICLE L T P C 3 0 0

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 9

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 9

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 9

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 9

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 9

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.

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 Fundamentals	CRC Press	2003

REFERENCES

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

17BEEE5E04 COMMUNICATION ENGINEERING L T P C 3 0 0

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

1.Ability to understand and analyse analog circuits.
2.Gain Knowledge on digital modulation techniques.
3.Understand coding techniques
4.Analysis the real time application of it.
5.Analysis the model of trnsmission medium.
6. to able to modulation and demodulation techniques.

UNIT I MODULATION SYSTEMS 9

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 9

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 9

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 9

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 9

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

TEXT BOOKS

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

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

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

17BEEE5E05 INTRODUCTION TO NEURAL NETWORKS L T P C 3 0 0

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 9

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

UNIT II BACKPROPAGATION NETWORKS 9

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 9

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 9

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

TOTAL: 45 HOURS

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

REFERENCES

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

17BEEE5E06 COMPUTER ARCHITECTURE L T P C 3 0 0 3

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.
- To study the recent techniques.

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 9

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 9

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.

UNIT V MEMORY ORGANIZATION 9

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

17BEEE5E07 DATA STRUCTURE AND ALGORITHMS L T P C 3 0 0 3

Course Objectives

Students will learn

- Application of stacks and queues
- Different types of ADT
- Different data analysis
- Different algorithm design and analysis
- Different algorithm for graphs
- Recent trends

Course Outcomes

Students will understand

- design and applications of linear, tree, and graph structures
- Application of stacks and queues
- Different types of ADT
- Different data analysis
- Different algorithm design and analysis
- Different algorithm for graphs

UNIT I LINEAR STRUCTURES 9

Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists – Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and queues

UNIT II TREE STRUCTURES 9

Need for non-linear structures – Tree ADT – tree traversals – left child right sibling data structures for general trees – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT

UNIT III BALANCED SEARCH TREES AND INDEXING 9

AVL trees – Binary Heaps – B-Tree – Hashing – Separate chaining – open addressing – Linear probing

UNIT IV GRAPHS 9

Definitions – Topological sort – breadth-first traversal - shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal – biconnectivity – euler circuits – applications of graphs

UNIT V ALGORITHM DESIGN AND ANALYSIS 9

Greedy algorithms – Divide and conquer – Dynamic programming – backtracking – branch and bound – Randomized algorithms – algorithm analysis – asymptotic notations – recurrences – NP complete problems

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	M. A. Weiss	Data Structures and Algorithm Analysis in C	Pearson Education, Asia	2002
2	ISRD Group	Data Structures using C	Tata McGraw-Hill Publishing Company Ltd.	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	A. V. Aho, J. E. Hopcroft, and J. D. Ullman	Data Structures and Algorithms	Pearson Education	1983
2	R. F. Gilberg, B. A. Forouzan	Data Structures: A Pseudocode approach with C	Thomson India Edition	2005
3	Sara Baase and A. Van Gelder	Computer Algorithms	Pearson Education	2000
4	T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein	Introduction to algorithms	Prentice Hall of India Ltd	2001

17BEEE5E08 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
- 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

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 FUZZY SETS AND RELATIONS 9

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

UNIT II FUZZY INFERENCE SYSTEM 9

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 9

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 9

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 9

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

REFERENCES

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

17BEEE5E09 DISTRIBUTED GENERATION L T P C 3 0 0 3

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 9

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 9

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 9

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 9

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 sub-stations and primary systems: Voltage drop and power loss calculations: Distribution feeder costs.

UNIT V DG INVERTERS CONTROL **9**

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

TOTAL: 45 HOURS

TEXT BOOK

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

REFERENCES

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

17BEEE5E10 DIGITAL SIGNAL PROCESSING L T P C 3 0 0

3 Course Objectives

- To introduce the concept of analyzing discrete time signals and systems in the time and frequencydomain.
- To classify signals and systems and their mathematical representation.
- To analyse 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.Analyse 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 9

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 9

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 9

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 9

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.

UNIT V PROGRAMMABLE DSP CHIPS 9

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, Ronald W Schafer and John R Buck	Discrete – Time Signal Processing	Pearson Education, New Delhi.	2003
2	Venkataramani, B., and Bhaskar, M.,	Digital Signal Processors, Architecture, Programming and Applications.	Tata McGraw Hill, New Delhi.	2003
3	Salivahanan, S., Vallavaraj, A., Gnanapriya, C	Digital Signal Processing	Tata McGraw Hill Publications, New Delhi.	2003

WEBSITES

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

17BEEE5E11 INDUSTRIAL AUTOMATION L T P C 3 0 0 3

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 (COs)

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. Analyse the various tuning controllers
4. Analyse the various advanced control techniques used in industrial automation.
5. Understand the application of SCADA.
6. Analyse the SCADA usuage in Industries.

UNIT I SENSORS, ACTUATORS 9

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 9

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 9

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 9

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

UNIT V ADVANCED CONTROL TECHNIQUES 9

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

TOTAL: 45 HOURS

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

REFERENCES

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

17BEEE5E012 SENSOR AND TRANSDUCER L T P C 3 0 0 3

Course Objectives

- It deals with various types of Sensors & Transducers and their working principle
- It deals with resistive transducers
- It deals with capative 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
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 9

Transducer – Classification of transducers – Basic requirement of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

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 9

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 9

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 9

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

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication

1	Sawhney A.K	A Course in Electrical and Electronics Measurements and Instrumentation	18th Edition, Dhanpat Rai & Company Private Limited	2007
2	Renganathan. S	Transducer Engineering	Allied Publishers, Chennai	2003

REFERENCES

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

17BEEE5E13 INTELLECTUAL PROPERTY RIGHTS L T P C 3 0 0

Course Objectives

- To study about the concept of intellectual property laws.
- To study about the trade marks and copy rights.
- To study trade marks 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.
- understand need of trade marks and its importance
- understand principles of copyrights and the legal process
- understand trade secrets and its security
- analysis various practical case studies of patent programmes
- handling higher level management legality in patent and trading

UNIT I INTRODUCTION 9

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 9

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 9

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 9

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.

UNIT V CASE STUDIES 9

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 Ghosh, and Gerard Ledwich	Power Quality Enhancement usung Custom Power Electronic Devices	Springer, USA	2002

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)

17BEEE6E01 COMPUTER ORGANIZATION AND ARCHITECTURE L T P C 3 0 0 3

Course Objectives

- 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 management hardware

Course Outcomes:

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 9

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 9

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 9

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

17BEEE6E02 EMBEDDED SYSTEM L T P C 3 0 0

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 students will be able to

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 9

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

UNIT II EMBEDDED SYSTEM ORGANIZATION 9

Structural units in processor , selection of processor & memory devices – DMA – I/O devices : timer and counting devices – Serial communication using I^2C , CAN USB buses – Parallel communication using ISA , PCI ,PCI/X buses – Device drivers.

UNIT III PROGRAMMING AND SCHEDULING 9

Intel I/O instructions – Synchronization - Transfer rate, latency; interrupt driven input and output - Non-maskable 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 9

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, чC/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.

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

REFERENCES

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

17BEEE6E03 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 9

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

UNIT II PLC PROGRAMMING 9

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 9

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 9

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 **9**

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

TEXT BOOKS

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

REFERENCES

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

WEBSITES

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

17BEEE6E04 COMPUTER NETWORKS L T P C 3 0 0

Course Objectives

- 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 9

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 9

Medium access – CSMA – Ethernet – Token ring – FDDI - Wireless LAN – Bridges and Switche

UNIT III SWITCHING 9

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 9

Email (SMTP, MIME, IMAP, POP3) – HTTP – DNS- SNMP – Telnet – FTP – Security – PGP - SSH

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Larry L. Peterson, Bruce S. Davie	Computer Networks: A Systems Approach	Third Edition, Morgan Kauffmann Publishers Inc	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
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

17BEEE6E05 HIGH VOLTAGE ENGINEERING L T P C 3 0 0 3

CourseObjectiv

- 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 9

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 9

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 Kamaraju, V	High Voltage Engineering	Tata McGraw Hill, New Delhi	2004
2	Kuffel, E. and Zaengl, W. S	High Voltage Engineering Fundamentals	Butterworth-Heinemann	2000

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of 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

17BEEE6E06 SPECIAL ELECTRICAL MACHINES L T P C 3 0 0

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

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

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 9

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 9

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 9

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 9

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 9

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

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of 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 Machines and Power Electronics	John willey & Sons, Second edition	2008

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hughes	Electric Motors and Drives	Affiliated East - West Press Pvt., Ltd	2007
2	S. Heier	Grid Integration of Wind Energy Conversion Systems	Wiley	2006
3	Ali Emadi (Ed)	Handbook of Automotive Power Electronics and Motor Drives	CRC Press	2005
4	H A Toliyat, S Campbell	DSP Based Electro Mechanical Motion Control	CRC Press	2004
5	Dubey.G.K	Fundamentals of Electric Drives	Alpha Science International Limited, Second revised edition	2008

17BEEE6E07 FIBRE OPTICS AND LASER INSTRUMENTS L T P C 3 0 0

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 9

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 9

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 9

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 9

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.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS 9

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. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	J.M. Senior	Optical Fibre Communication – Principles and Practice‟	Prentice Hall of India – 2nd edition	2013
2	J. Wilson and J.F.B. Hawkes	Introduction to Opto Electronics‟	Prentice Hall of India	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	G. Keiser	Optical Fibre Communication‟	McGraw Hill – 4th edition	2012
2	M. Arumugam	Optical Fibre Communication and Sensors‟	Anuradha **Publicatio**	2002

17BEEE6E08 MOBILE COMMUNICATION L T P C 3 0 0

Course Objectives

- 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

1. Understand past, present and future trends in mobile communication.
2. Gain knowledge about mobile cellular communication
3. Understand various standards in use for wireless communication and its application.
4. Demonstrate some basic application of GPS.
5. Gain knowledge about RADAR working and its applications
6. Gathered knowledge in digital modulation and equalization techniques suitable for mobile communication.

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 9

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 9

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 9

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 9

Second generation and third generation wireless network and standards, WLL, blue tooth, GSM, IS–95 and DECT.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rappaport, T. S	Wireless Communications: Principles and Practice	Prentice Hall of India, New Delhi	2003
2	Blake, R	Wireless Communication Technology	Thomson Delmar, New York	2003

REFERENCES

S. No.	Author(s) Name	Title of theBbook	Publisher	Year of Publication
1	Stephen G Wilson	Digital Modulation and Coding	Pearson Education, New Delhi	2003
2	Jochen Schiller	Mobile Communications	Addison Wesley, Boston	2003
3	Mischa Schwartz	Mobile Wireless Communications	Cambridge University Press, Cambridge, UK	2005

WEBSITES

1. www.pearson.ch/download/media/9780130422323.pdf
2. www.wtec.org/loyola/wireless/chapter02.pdf

17BEEE6E09 SWITCHED MODE POWER CONVERSION L T P C 3 0 0

Course Objectives

- To study and gain knowledge about switched mode power conversion.
- To study about technology in SMPS
- To study the technology in various functions
- To study the resonant converter and its applications
- To study the basic power converters and its techniques
- To gather information about harmonics and its impacts

Course Outcomes

- 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 acquire knowledge about industrial UPS applications
- To know the importance of power quality system in advanced equipments
- To know the design of conversion ratio

UNIT I INTRODUCTION 9

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 9

Switched mode power converters – continuous and discontinuos 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 9

Pulse width modulated converter: average modeled of the converter – steady state solution – transfer function of the converter- generalized state space mode of the converter – linear small signal model – dynamic functions of the converter.

UNIT IV RESONANT CONVERTERS 9

Resonant converters – ZCS Resonant converters – L and M type – ZVS Resonant converters- comparison 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

UNIT V HARMONICS **9**

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. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Issa Batarseh	Power Electronic Circuits	John Wiley	2004
2	Philip T Krein	Elements of Power Electronics	Oxford Press	2014

17BEEE6E10 BIOMEDICAL INSTRUMENTATION L T P C 3 0 0

Course Objectives

- 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 equipment.

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 9

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 9

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 9

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 9

X–ray machine – Radiographic and fluoroscopic techniques – Computer Tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety.

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENT 9

Pacemakers – Defibrillators – Ventillators – Nerve and muscle stimulators – Diathermy – Heart-Lung machine – Audio meters – Dializers.

TOTAL: 45 HOURS

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. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Arumugam, M	Bio–Medical Instrumentation	Anuradha Agencies, Kumbakonam	2003
2	Webster, J	Medical Instrumentation	John Wiley and Sons, New York	1995
3	Rajarao.C. and Guha, S.K	Principles of Medical Electronics and Bio–medical Instrumentation	Universities Press India Ltd., India	2000
4	Khandpur, R. S	Biomedical Instrumentation: Technology and Applications	McGraw–Hill Education, Europe	2004

WEBSITES

1. www.biopac.com
2. www.britannica.com/EBchecked/topic/674616/transducer

17BEEE6E11 MODERN SEMICONDUCTOR DEVICES L T P C 3 0 0 3

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 9

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 9

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 9

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 9

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 9

Single phase rectifiers and Three phase rectifiers using Diodes and Thyristors, Choppers, Inverters using GTOs-IGBTs and power JFETs & MOSFETs.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mohan. Net al	Power Electronics: Converters, Applications and Design	John Wiley and Sons, New York, Third Edition	2002
2	Rashid M.H	Power Electronics Circuits, Devices and Applications	Prentice Hall India, Third edition, New Delhi	2004

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	M.D. Singh and K.B.Khanchandani	Power Electronics	Tata McGraw Hill, New Delhi, Second Edition	2008
2	Donald A.Neamen	Semiconductor Physics and Devices	Tata McGraw Hill, New Delhi, Fourth Edition	2011
3	Kassakian,J.G.et.al	Principles of Power Electronics	Pearson Education India	2010

17BEEE6E12 POWER SYSTEM OPERATION AND CONTROL L T P C 3 0 0 3

Course Objectives

- To model the power system under steady state operating condition
- To understand and apply iterative techniques for power flow analysis
- To model and carry out short circuit studies on power system
- To model and analyze stability problems in power system
- To study the monitoring and control of a power systems.
- To study the basics of power system economics.

Course Outcomes (COs)

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

1.Use numerical methods to analyse 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 INTRODUCTION 9

System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration 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 9

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 9

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 profile and to minimize transmission loss.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 9

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 9

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 Theory – An Introduction	Tata McGraw Hill Publishing Company Ltd, New Delhi 2nd Edition,.	2007
2	Allen J Wood; Bruce F Wollenberg; Gerald B Sheblé	Power Generation, Operation and Control	Hoboken, New Jersey : Wiley-Interscience	2014

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	Tata McGraw Hill Publishing Company Limited, 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/CourseObjective.html

PROFESSIONAL ELECTIVE- V

(ONLY APPLICABLE FOR SEVENTH SEMESTER)

17BEEE7E01 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. 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 system tools.
- To understand about representing knowledge.
- To acquire knowledge about the reasoning and decision making in uncertain world. To 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 9

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 9

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 9

Uncertainty – Acting under uncertainty – Basic probability notation – Axioms of probability – Baye's rule – Probabilistic reasoning – Making simple decisions.

UNIT IV PLANNING AND LEARNING 9

Planning: Planning problem – Partial order planning – Planning and acting in non–deterministic domains.

Learning: Learning decision trees – Knowledge in learning – Neural networks – Reinforcement learning – Passive and active.

UNIT V EXPERT SYSTEMS 9

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

17BEEE7E02 HVDC AND EHVAC L T P C 3 0 0

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

1. Justify the advantages of dc transmission over ac transmission.
2. Reproduce the operation of Line Commutated Converters and Voltage Source Converters.
3. Evaluate the control strategies used in HVdc transmission system.
4. Identify and propose the improvement of power system stability using an HVdc system.
5. gain knowledge about HVDC transmission, converters used and about EHVAC systems.
6. Analysis the real time application of it.

UNIT I EHV TRANSMISSION 9

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 9

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 HVDC TRANSMISSION SYSTEMS 9

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 9

Pulse number – Choice of Converter Configuration – Simplified analysis of Graetz circuit – 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. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Naidu, M. S. and Kamaraju, V	High Voltage Engineering	Tata McGraw Hill, New Delhi	2004
2	Kuffel, E. and Zaengl, W. S	High Voltage Engineering Fundamentals	Butterworth-Heinemann	2000

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of 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

17BEEE7E03 POWER SYSTEM ECONOMICS L T P C 3 0 0

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 9

Cost of electrical energy-expressions for cost of electrical energy-capital-interest-depreciation-different methods-factors affecting cost of operation-number and size of generating units-importance of high load factor-importance of power factor improvement-most economical power factor-meeting the KW demand on power stations-power system tariffs.

UNIT II ECONOMIC DISPATCH 9

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 9

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 9

Interconnected operation-economic operation of hydro thermal power plants-λ-γ iteration scheme-gradient approach-modeling and solution approach to short term and long term hydro-thermal scheduling problem using dynamic programming.

UNIT V OPTIMAL POWER FLOWS 9

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

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Allen J Wood and B F Wollenberg	Power Generation, Operation and Control	John Wiley & Sons, New York	1984
2	I J Nagrath and D P Kothari	Modern Power System Analysis	Tata McGraw Hill, New Delhi.	-

17BEEE7E04 POWER SYSTEM RESTRUCTURING AND DEREGULATION

L T P C 3 0 0 3

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.
- 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 **9**

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 **9**

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 **9**

Transmission Pricing In Open Access System - Introduction – rolled in pricing methods – marginal pricing method – embedded cost recovery – pricing models in different countries.

UNIT IV **9**

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 **9**

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.

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

REFERENCES

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.

UNIT I INTRODUCTION TO POWER QUALITY 9

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 9

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 9

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 9

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 9

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

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Roger C Dugan, Mark, F., McGranagham, Surya Santoso, Wayne Beaty, H	Electrical Power Systems Quality	McGraw Hill, New York	2003
2	C. Sankaran	Power Quality	CRC Press, Florida	2002

17BEEE7E06 POWER SYSTEM DYNAMICS L T P C 3 0 0

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. Analyse 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 9

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

UNIT II MACHINE MODELING 9

Park's transformation- flux linkage equations, current space model- per unit conversion- normalizing 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 9

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 9

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 9

System response to small disturbances- Linear model of the unregulated synchronous machine and its modes of oscillation- regulated synchronous machine- distribution of power impact- linearization of the load equation for the one machine problem – Simplified linear model- effect of excitation on dynamic stability- approximate system representation- supplementary stabilizing signals- dynamic performance measure- small signal performance measures.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Anderson.P.M and Fouad.A.A	Power System Control and Stability	Galgotia Publications, New Delhi	2003

REFERENCES

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

17BEEE7E07 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 theirinteractions.
- 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 **9**

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 **9**

Mathematical formulation – Discretisation – Shape functions – Stiffness matrix – Solution techniques – Post processing.

UNIT III CAD PACKAGES **9**

Recent developments – Preprocessing – Modeling - Meshing – Boundary conditions -Material characteristics – Problem formulation – Solution – Post processing.

UNIT IV CAD SOFTWARE **9**

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 **9**

Design of actuator – Solenoid -Transformer - Induction motor – Synchronous machines - Switched reluctance motor.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	P.P. Silvester and Ferrari	Finite Element for Electrical Engineers	Cambridge University Press, 3rd 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

REFERENCES

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	

17BEEE7E08 DIGITAL SYSTEM DESIGN USING VHDL L T P C 3 0 0 3

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 9

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 9

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.

UNIT III DESIGN OF COMBINATIONAL CIRUITS 9

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 9

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 9

Building block circuits – Design examples – clock synchronization, testing of logic circuits – fault model, test set – path sensitizing, testing of sequential circuits.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Stephen Brown, Zvonko Vranesic	Fundamentals of digital logic design with VHDL	Tata McGraw-Hill Publishing company limited	2009
2	Volnei.A.Pedroni	Circuit design with VHDL	PHI Learning Private Limited	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Douglas L. Perry	VHDL Programming by example	Tata McGraw-Hill Publishing company limited	2009
2	J.Bhasker	A VHDL primer	Prentice-Hall India Learning Private Limited	2003

17BEEE7E09 OPTIMIZATION TECHNIQUES L T P C 3 0 0

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 9

Definition- Classification of optimization problems- Unconstrained and Constrained optimization-Optimality conditions- Classical Optimization techniques.

UNIT II OPTIMAL POWER SYSTEM OPERATION 9

Economic Dispatch problem-Unit commitment-Optimal Power Flow Problem- Solution Using Classical methods

UNIT III EVOLUTIONARY COMPUTATION TECHNIQUES 9

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 9

Fundamental principle-Velocity Updating-Advanced operators-Hybrid approaches Implementation issues-Solution of OPF problem

UNIT V MULTI OBJECTIVE OPTIMIZATION 9

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) Name	Title of the Book	Publisher	Year of Publication
1	Kalyanmoy Deb	Multi objective optimization using Evolutionary Algorithms	John Wiley and Sons	2008
2	D.P.Kothari and J.S.Dhillon	Power System Optimization	2nd Edition, PHI learning private limited	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Carlos A.Coello Coello, Gary B.Lamont, David A.Van Veldhuizen	Evolutionary Algorithms for solving Multi Objective Problems	2 nd Edition, Springer	2007
2	Kwang Y.Lee,Mohammed A.El Sharkawi	Modern heuristic optimization techniques	John Wiley and Sons	2008

17BEEE7E10 REAL TIME OPERATING SYSTEM L T P C 3 0 0 3

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 9

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 9

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-pre-emptive Kernels - Pre-emptive Kernels – Re-entrancy- Re-entrant 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 9

Introduction - µC/OS-II Features - Goals of µC/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under µC/OS-II – Clock Tick - µC/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 9

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 **9**

Memory Control Blocks – Creating Partition- Obtaining a Memory Block – Returning a Memory Block .Getting Started with µC/OS-II – Installing µC/OS-II – Porting µC/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with µC/OS-II – µC/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Analyze the Multichannel ADC with help of µC/OS-II.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of 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

REFERENCES

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

17BEEE7E11 ADVANCES IN SOFT COMPUTING L T P C 3 0 0 3

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 9

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 9

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 9

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 NEURO FUZZY MODELING 9

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 9

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency prediction – Soft Computing for Color Recipe Prediction.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	J.S.R.Jang, C.T.Sun and E.Mizutani	Neuro-Fuzzy and Soft Computing	PHI, Pearson Education	2004
2	Davis	Genetic Algorithms:Search,	Addison Wesley,	2004
3	E.Goldberg	Optimization and Machine Learning	N.Y	-

REFERENCES

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)

17BEEE8E01 FLEXIBLE AC TRANSMISSION SYSTEMS L T P C 3 0 0

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

C**ourse Outcomes**

- 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 applcation studied about FACTS

UNIT I INTRODUCTION TO FACTS 9

Reactive power control in electrical power transmission lines - series compensation -Concepts of SVC, TCSC and UPFC.

UNIT II SVC AND ITS APPLICATIONS 9

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 9

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 9

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.

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. No.	Author(s) Name	Title of the Book	Publisher	Year of 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 Flexible AC Transmission Systems	IEEE High Power Engineering Review volume 8: issue 7	2002

WEBSITES

1. www.uni–due.de
2. www.chetanasprojects.com

17BEEE8E02 POWER SYSTEM STABILITY L T P C 3 0 0

Course Objectives

- 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 analyse 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.
- Analyse 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.	-

17BEEE8E03 POWER GENERATION SYSTEMS L T P C 3 0 0

Course Objectives

- 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 Powerplant instrumentation
- To acquire knowledge of renewable power system

Course Outcomes

- At the end of the course the student will gain knowledge about economixcs 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 9

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 9

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 9

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-MONITORING AND CONTROL 9

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 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

17BEEE8E04 TOTAL QUALITY MANAGEMENT L T P C 3 0 0 3

Course Objectives

- 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 9

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 9

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 9

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 **9**

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 **9**

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 HOUR

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Dale H Besterfiled	Total Quality Management	Pearson Education, Inc., New Delhi	2003
2	Narayana, V. and Sreenivasan, N.S	Quality Management – Concepts and Tasks	New Age International, New Delhi - reprint	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	James R Evans and William M Lidsay	The Management and Control of Quality	South–Western Thomson Learning, United States – 8th edition	2011

WEBSITE

www.management.about.com

17BEEE8E05 VIRTUAL INSTRUMENTATION L T P C 3 0 0 3

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 9

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 9

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 9

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 9

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

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication

1	Sanjeev Gupta	Virtual Instrumentation using LabVIEW’	TMH	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

17BEEE8E06 ROBOTICS AND AUTOMATION L T P C 3 0 0 3

Course Objectives

- 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 9

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 9

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 9

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 9

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill Climbing Techniques – robot programming languages

UNIT V CASE STUDIES 9

Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications– robot cell design – selection of robot.

TOTAL: 45 PERIODS

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF 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. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF 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

17BESHOE01 PROBABILITY AND RANDOM PROCESS L T P C 3 0 0

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. To use English language for communication: verbal & non-verbal.
2. To enrich comprehension and acquisition of speaking & writing ability.
3. To inculcate the habit of reading and to develop their effective reading skills.
4. To hone their listening, speaking, Reading and writing skills.
5. To gain confidence in using English language in real life situations.
6. To improve word power: lexical, grammatical and communication competence.

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 9

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 9

Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions – Covariance - Correlation and regression

UNIT- IV CLASSIFICATION OF RANDOM PROCESS 9

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 9

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. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peebles Jr, P.Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Publishers, New Delhi.	2002

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ross, S	A first Course in Probability	Pearson Education, New Delhi (Chap 2 to 8)	2012
2	Gupta, S.C. and Kapoor, V.K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2014
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. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld. Wolfram.com

17BESHOE02 FUZZY MATHEMATICS L T P C 3 0 0 3

Course Objectives

- 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

1. To gain the main subject of fuzzy sets.
2. To understand the concept of fuzziness involved in various systems and fuzzy set theory.
3. To gain the methods of fuzzy logic.
4. To comprehend the concepts of fuzzy relations.
5. To analyze the application of fuzzy logic control to real time systems.
6. The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNIT I FUZZY SETS 9

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 9

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III FUZZY RELATIONS 9

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 9

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures

UNIT V FUZZY INFERENCE 9

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

TOTAL : 45 HOURS

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. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

17BESHOE03 LINEAR ALGEBRA L T P C 3 0 0 3

Course Objectives

- 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

The 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 Mathematics.

UNIT I VECTOR SPACES 9

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 9

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNIT III SYSTEM OF LINEAR EQUATIONS 9

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 9

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

UNIT V INNER PRODUCT SPACES **9**

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

TOTAL : 45 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	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

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

17BESHOE04 ENGINEERING ACOUSTICS L T P C 3 0 0 3

Course Objectives

- To disseminate the fundamentals of acoustic waves.
- To inculcate the characteristics of radiation and reception of acoustic waves.
- To divulge knowledge on the basics of pipe resonators and filters.
- To introduce the features of architectural acoustics.
- To impart the basic knowledge of transducers and receivers
- To study about the pipes resonants and filters

.

Course Outcomes

1. Develop the idea of the fundamentals of acoustic waves.
2. Apply the concepts of radiation and reception of acoustic waves.
3. Explain the basic ideas of pipe resonators and filters.
4. Illusrate the basics of architectural acoustics.
5. Illustrate the transducers and receivers and its applications in various electronic devices.
6. Apply the knowledge inputs of the course for engineering applications.

UNIT I INTRODUCTION 9

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 9

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 9

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 9

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.

UNIT V TRANSDUCTION 9

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) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lawerence E.Kinsler, Austin R.Frey,	Fundamentals of Acoustics	John Wiley & Sons	2000

REFERENCE

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	F. AltonEverest &	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

17BESHOE05 SOLID WASTE MANAGEMENT L T P C 3 0 0 3

Course Objectives

- 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

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 9

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 9

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 9

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 9

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, Remediation, risk assessment.

UNIT V ENERGY GENERATION FROM WASTE 9

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

TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental Chemistry and Pollution Control	S.Chand and Company Ltd., New Delhi.	2011

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series in Energy)	Woodhead Publishing Ltd., Cambridge, UK	2013
2.	Frank Kreith, George Tchobanoglous	Hand Book of Solid Waste Management- 2nd edition	McGraw Hill Publishing Ltd., Newyork	2002
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	1999

WEBSITES

1.www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Was

te. 2.http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/

3.www.alternative-energy-news.info/technology/garbage-energy/

4. nzic.org.nz/ChemProcesses/environment/

17BESHOE06 GREEN CHEMISTRY L T P C 3 0 0 3

Course Objectives

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

1. Outline the basic principles of green chemistry (K).
2. Examine the different atom efficient process and synthesis elaborately (S).
3. Apply the concepts combustion of green technology (S).
4. Identify and apply the concepts of renewable energy (S).
5. Apply the concepts of green catalysts in the synthesis (S).
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO GREEN CHEMICAL PRINCIPLES 9

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 9

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 9

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 9

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 glucose and biomass conversion.

UNIT V CATALYSIS IN GREEN CHEMISTRY 9

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.

TOTAL : 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sanjay K. Sharma, Ackmez Mudhoo	Green Chemistry for Environmental Sustainability	CRC Press , London	2010
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2nd edition	Anamaya publishers., New Delhi.	2007

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons., New Delhi.	2012
2.	Mukesh Doble. Ken Rollins, Anil Kumar	Green Chemistry and Engineering, 1st edition	Academic Press, Elesevier., New Delhi.	2007
3.	Desai K. R.	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
4.	Matlack A. S.	Introduction to Green Chemistry	Marcel Dekker: New York	2001

WEBSITES

1. http://www.organic-chemistry.org/topics/green-chemistry.shtm

2.http://www.essentialchemicalindustry.org/processes/green-chemistry.html

3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm

4. http://www.epa.gov/research/greenchemistry/

5. http://www.amazon.in/Green-Chemistry-Catalysis

17BESHOE07 APPLIED ELECTROCHEMISTRY L T P C 3 0 0 3

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 9

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 9

Electropolymerisation- 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 9

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 9

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

UNIT V ELECTROCHEMICAL MATERIAL SCIENCE 9

Solar cells- Preparation of CdS/Cu_2S 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. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
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. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
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

17BESHOE08 INDUSTRIAL CHEMISTRY L T P C 3 0 0 3

Course Objectives

1. To make the students conversant with **cement and lime** and its uses.
2. To make the student acquire sound knowledge of abrasives and refractories.
3. To acquaint the student with concepts of inorganic chemicals.
4. To develop an understanding of the basic concepts **explosives**.
5. To acquaint the students with the basics of **agriculture chemicals**.
6. To study the concepts of explosives and smoke screens(S)

Course Outcomes

1. Outline the basic chemistry of **cement and lime (K).**
2. Examine the uses of abrasives and refractories (S).
3. Identify the usage of the inorganic chemicals. (S)
4. Identify the concepts of explosives and smoke screens (S).
5. Identify the usage of the **agriculture** chemicals (S).
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A).

UNIT I CEMENT AND LIME 9

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 9

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 9

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 9

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.

UNIT V AGRICULTURE CHEMICALS **9**

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

TOTAL : 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Harikrishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2.	James A. Kent	Hand Book of Industrial Chemistry, 9^{th} edition	Van Nostrand Reinhold, New York.	1992
3.	R.N. Sherve	Chemical Process Industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
4.	S.D. Shukla and G.N. Pandy	A Text book of Chemical Technology	Vikas Publishing House (P) Ltd, New Delhi.	1979

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

17BESHOE09 ENGLISH FOR TECHNOCRATS L T P C 1 4 0 3

Course Objective:

1. Develop abilities to write technically and expressively.
2. Recognize writing as a constructive, meaningful process.
3. Practice using reading strategies for effective writing.
4. Design effective technical documents for both print and digital media.
5. Identify the qualities of good technical writing.
6. To study the reading ability for effective writing

Course Outcomes:

Students undergoing this course are able to

1. Construct simple sentences, correct common grammatical errors in written English.
2. Develop confidence in English language by imbibing lexical and syntax rules.
3. Enrich their reading ability for effective writing.
4. Elevate them to minimize word, sentence, and paragraph length without sacrificing clarity or substance
5. Familiarize with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.
6. Demonstrate the basic components of definitions, descriptions, process explanations, and other common forms of technical writing.

UNIT I BASICS OF WRITING

Introduction to Technical Writing – Importance of Writing – Characteristics of Writing– Audience Recognition/ Analysis – Appropriateness of language — Conciseness and Flow– Bias free and plain writing – Impersonal and Formal Language -Techniques of Technical Writing– Overcoming writer‟s block

– Prioritizing for effective writing– Avoiding plagiarism.

UNIT II PARAGRAPHS AND ESSAYS

Expressing Ideas – Paragraph construction – Cohesion and Coherence – Adequate development – Kinds of paragraphs – Writing drafts – Paragraph length and pattern – Types of Essays – Characteristics of Essays – Salient point of sentence constructions.

UNIT III LETTERS, MEMOS AND EMAIL

Formal written correspondence – Types of messages – Business letters – Structure of letters – Language in letters – Tense in letters – Cover letters – Resumes – Curriculum vitae – Memos – Emails – Email Etiquette – Effectiveness and purpose.

UNIT IV THE ART OF CONDENSATION AND TECHNICAL PROPOSALS

Steps to Effective précis writing – Guidelines – Technical Proposals – Types of Proposals – Characteristics – Body of the Proposals – Style and appearance – Evaluation of proposals – Proof Reading – Book /Film Review – Travelogue – Dialogue Writing.

UNIT V REPORTS AND RESEARCH ARTICLES

Discussion of newspaper articles -Objectives of Reports – Characteristics of Reports – Structure of Reports – Types of Reports – Writing an article – Writing research articles – Essential features of Dissertation – Organizing the structure of thesis and articles – Writing technical description.

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Article IX. V.N. Arora & Lakshmi Chandra	Article X. Improve Your Writing: Revised First Edition	OUP	2014

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Crème, P. and M. Lea.	Writing at University: A guide for students.	OUP	2003
2	Graham King	Collins Improve Your Writing	Collins; First edition	2009
3	David Morley	The Cambridge Intro. To Creative Writing	Cambridge	2008

WEBSITES:

http://www.stevepavlina.com/blog/2006/08/10-ways-to-improve-your-technical-skills/

http://www.nyu.edu/classes/keefer/brain/net2.html

https://www.udemy.com/technical-writing-and-editing/

http://techwhirl.com/what-is-technical-writing/

COMPUTER SCIENCE ENGINEERING

17BECSOE01 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 ofPERL
- 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 9

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 9

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 9

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 **9**

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 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 **9**

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

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Paul Deitel, Harvey Deitel and Abby Deitel	Internet and World Wide Web-How to Program	5th Edition	2011
2	N.P. Gopalan and J. Akilandeswari	Web Technology: A Developer's Perspective	PHI Learning, Delhi	2013

REFERENCES

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

17BECSOE02 MULTIMEDIA AND ANIMATION L T P C 3 0 0 3

COURSE OBJECTIVES:

- 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 9

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 9

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers
- Action script.

UNIT III 3D ANIMATION & ITS CONCEPTS 9

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 9

Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

UNIT V Concept Development 9

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

TOTAL: 45 HOURS

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

17BECSOE03 PC HARDWARE AND TROUBLE SHOOTING L T P C 3 0 0 3

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 peripherals.

COURSE OUTCOME:

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 9

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 9

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 9

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 9

Introduction – system configuration – pre installation planning – Installation practice – routine checks

– PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.

UNIT V Troubleshooting **9**

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.

TOTAL: 45 HOURS

TEXT BOOK

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

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

17BECSOE04 JAVA PROGRAMMING

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:

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

- 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 **9**

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 **9**

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

UNIT III I/O STREAMS **9**

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 **9**

Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using exceptions for debugging

UNIT V THREADS **9**

Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Cay S. Horstmann and Gary Cornell	Core Java: Volume I – Fundamentals	Sun Microsystems Press	2008

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

1. http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/
2. http://www.winprog.org/tutorial/msvc.html
3. http://www.tutorialized.com/tutorials/Visual-C/1
4. http://www.freeprogrammingresources.com/visualcpp.html

17BEECOE01 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 task management

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 9

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 9

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 9

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 9

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 **9**

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

REFERENCES

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Jean J. Labrosse	MicroC/OS – II The Real Time Kernel	CMP BOOKS	2009
2	David Seal	ARM Architecture Reference Manual	Addison-Wesley	2008
3	Steve Furbe	ARM System-on-Chip, Architecture	Addison-Wesley Professional California	2000

17BEECOE02 CONSUMER ELECTRONICS L T P C 3 0 0 3

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

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

- 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 9

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 9

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 9

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 9

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 9

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

TOTAL: 45 HOURS

TEXT BOOK

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	S.P.Bali	Consumer Electronics	Pearson Education	2005

17BEECOE03 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 problem.

UNIT I INTRODUCTION TO NEURAL NETWORKS 9

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 9

Error – correction learning – memory based learning - hebbian learning-competitive learning-Boltzmann learning- supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCE PTION 9

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 9

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

UNIT V SELF ORGANIZATION **9**

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. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Simon Haykin	Neural Networks and Learning Machines	3/E - Pearson/ Prentice Hall	2009
2	Satish Kumar	Neural Networks : A Classroom Approach	TMH	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

17BEECOE04 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
- Analyse the real time application of it
- Understand the ANFIS

UNIT – I **9**

Basics Of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT – II **9**

Theory Of Approximate Reasoning**:** Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference-fuzzy models

UNIT – III **9**

Fuzz y Knowledge Based Controllers (Fkbc**):** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzfication and defuzzyfication procedures – Design of Fuzz y Logic Controller

UNIT – IV **9**

Adaptive Fuzzy 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 **9**

Simple applications of FKBC -washing machines- traffic regulations -lift control-fuzz y in medical applications-Introduction to ANFIS.

TOTAL: 45 HOURS

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

17BTBTOE01 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 9

Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNIT II REACTOR DESIGN 9

Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNIT III HEAT TRANSFER EQUIPMENTS 9

Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNIT IV MASS TRANSFER EQUIPMENTS 9

Design of Bollmann extractor, fractionating column, packed tower and spray tray absorber

UNIT V SEPARATION EQUIPMENTS 9

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 PUBLICATI
1	James Edwin Bailey, David F. Ollis	Biochemical Engineering Fundamentals	McGraw-Hill	2007

2	Don W. Green, Robert H. Perry	Chemical Engineer Hand book	The McGraw- Hill Companies,	2008

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Pauline. M. Doran	Bioprocess Engineering Principles	Academic Press	2013

17BTBTOE02 FOOD PROCESSING AND PRESERVATION L T P C 3 0 0 3

Course Objectives

- To learn the scope and 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 9

Propertiesof food- Physical, thermal, mechanical, sensory. Raw material Preparation - Cleaning, sorting, grading, peeling.

UNIT II PROCESSING METHODS 9

Heating- Blanching and Pasteurization. Freezing- Dehydration- canning- additives- fermentation- extrusion cooking- hydrostatic pressure cooking- dielectric heating- micro wave processing and aseptic processing – Infra red radiation processing- Concepts and equipment used.

UNIT III FOOD CONVERSION OPERATIONS 9

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membrane separation- filtration- equipment and application.

UNIT IV FOOD PRESERVATION BY COOLING 9

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control water activity.

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	PUBLISHER	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	PUBLISHER	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

17BTBTOE03 BASIC BIOINFORMATICS L T P C 3 0 0 3

Course Objectives

- To understand the available tools and databases for performing research in bioinformatics.
- To expose students to sequence alignment tool in bioinformatics.
- 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 9

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 9

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 9

Phylogenetics, cladistics & ontology; building phylogenetic trees; evolution of macromolecular sequences.Sequence annotation: principles of genome annotation; annotation tools & resources.

UNIT IV STRUCTURAL BIOINFORMATICS 9

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 &

predictionstrategies.

UNIT V MICROARRAY DATA ANALYSIS 9

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.

TOTAL: 45 HOURS

TEXTBOOK

S. NO.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dan E. Krane, Micha L. Rayme	Fundamental Concepts of Bioinformatics	Pearson education	2004
2	Andreas D. Baxevanis, B. F. Francis Ouellette	Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins	Wiley-Interscience	2004
3	David W. Mount	Sequence and Genome Analysis	Cold Spring Harbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

REFERENCE BOOKS

S. NO.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Michael J. Korenberg	Microarray Data Analysis: Methods and Applications	Springer Science & Business Media	2007

17BTBTOE04 FUNDAMENTALS OF NANOBIOTECHNOLOGY L T P C 3 0 0 3

Course Objectives

- To impart the skills in the field of nano biotechnology and its applications.
- To acquire knowledge in the nano particles and its significance in various fields.
- 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 9

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 9

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 9

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 9

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.

UNIT V ETHICAL ISSUES IN NANOTECHNOLOGY 9

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) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIONS
1	Niemeyer, C.M. and Mirkin, C.A	Nanobiotechnology: Concepts, Applications and Perspectives	Wiley-VCH	2004
2	Goodsell, D.S.	Bionanotechnology	John Wiley and Sons, Inc	2004

REFERENCE BOOKS

S.NO	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

17BEMEOE01 COMPUTER AIDED DESIGN L T P C 3 0 0 3

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 II INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS TRANSFORMATIONS 9

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts, Graphical input technique, Geometric transformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRIC MODELING 9

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 9

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

UNIT V PRODUCT DESIGN AND DEVELOPMENT 9

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 PUBLICATION
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

17BEMEOE02 INDUSTRIAL SAFETY AND ENVIRONMENT L T P C 3 0 0 3

Course Objective

- To recognize and evaluate occupational safety and health hazards in the workplace.
- To determine appropriate hazard controls following the hierarchy of controls.
- To analyse the effects of workplace exposures, injuries and illnesses, fatalities.
- To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
- To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
- 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 9

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 9

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS 9

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 9

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 9

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

TOTAL:45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
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 PUBLICATION
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

17BEMEOE03 TRANSPORT PHENOMENA L T P C 3 0 0 3

Course Objective

1. To generalized equations for mass, momentum and heat.
2. To understand the concepts of Reynolds and Gauss theorems.
3. To learn combined diffusive and convective transport.
4. To apply Film- and penetration models for mass and heat transfer.
5. To apply Stefan-Maxwells equations for multi-component diffusion.
6. To Solve the given set of equations either analytically or numerically.

Course Outcomes

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

1. Generalized equations for mass, momentum and heat.
2. Understand the concepts of Reynolds and Gauss theorems.
3. Learn combined diffusive and convective transport.
4. Apply Film- and penetration models for mass and heat transfer.
5. Apply Stefan-Maxwells equations for multi-component diffusion.
6. Solve the given set of equations either analytically or numerically.

UNIT I INTRODUCTION AND BASIC CONCEPTS 9

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 OTHER PHYSICAL PARAMETERS 9

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III MOMENTUM TRANSPORT 9

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 9

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

UNIT V MASS TRANSPORT **9**

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

REFERENCE

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEBSITES

1. https://laulima.hawaii.edu/portal

17BEMEOE04 INTRODUCTION TO BIOMECHANICS L T P C

3 0 0 3

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

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 **9**

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 **9**

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY **9**

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 **9**

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 9

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

TOTAL: 45 HOURS

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
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

17BEAEOE01 AUTOMOBILE ENGINEERING L T P C 3 0 0 3

Course Objectives

- To impart the knowledge on 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 the knowledge on wheels, tyres and brakes of automobiles.
- To provide the information on 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 9

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 9

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

UNITIII SUSPENSION SYSTEM 9

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 driving comfort.

UNIT IV BRAKES 9

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 9

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

TEXT BOOKS

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	Tata McGraw-Hill Publishing Co., New Delhi	2003
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publisher	2011

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, 3rd 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

17BEAEOE02 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 9

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS 9

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 9

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 9

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 for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS 9

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

17BEAEOE03 AUTOMOBILE MAINTENANCE 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 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 9

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 9

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 9

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.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE 9

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

TEXT BOOKS

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 Different Vehicle Manufacturers			

17BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY L T P C

3 0 0 3

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 9

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNIT II DRIVER ASSISTANCE SYSTEMS 9

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 9

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION 9

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT V TELEMATICS 9

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

TOTAL: 45 HOURS

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	Navigation and Intelligent Transportation Systems –Progress in Technology	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, 5th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	Understanding Automotive Electronics	SAE	1998
3.	Robert Bosch	Automotive HandBook, 5th Edition	SAE	2000

17BECEOE01 HOUSING, PLAN AND MANAGEMENT L T P C 3 0 0 3

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 bye 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 9

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 9

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 9

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 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f 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 BOOK	PUBLISHER	YEAR OF 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

17BECEOE02 BUILDING SERVICES L T P C 3 0 0 3

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 9

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 9

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 9

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 9

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 – 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 **9**

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non- combustible 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

TEXT BOOKS

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

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF 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

17BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS L T P C 3 0 0 3

Course 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.

Course 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 9

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 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV OPERATION **9**

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V INVOLVEMENT OF STAKE HOLDERS **9**

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 BOOK	PUBLISHER	YEAR OF 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 BOOK	PUBLISHER	YEAR OF 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

17BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY L T P C 3 0 0 3

OBJECTIVE

- To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
- To study different methods of construction to successfully achieve the structural design with recommended specifications.
- To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
- To study of construction equipment's, and temporary works required to facilitate the construction process
- To provide a coherent development to the students for the courses in sector of Advanced construction technology.
- To present the new technology of civil Engineering and concepts related Advanced construction technology.

Course Outcome

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 9

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 9

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting,Tunneling and hoisting

UNIT - IV MODERN CONSTRUCTION EQUIPEMENTS -II 9

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 BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peurifoyu , R. L., , Ledbette, W.B	Construction Planning , Equipment and Methods	Mc Graw Hill Co	2000
2	Antill J.M	PWD, Civil Engineering Construction	Mc Graw Hill Book Co	2005

REFERENCE

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF 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

17BEEEOE01 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 effciency 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 9

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 9

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 9

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 9

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 **9**

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.

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 Fundamentals	CRC Press – 2nd edition	2010

REFERENCES

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	Standards media – 2nd edition	2009
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley – 2nd edition	2012

17BEEEOE02 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 9

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 9

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 9

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 9

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 pumps- air conditioning system- energy efficient transformers.

UNITV 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 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 Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	(b) Lulu Enterprises, Inc. - 8th Edition Volume II	2013

17BEEEOE03 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 flo charts 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 industrail application of PLC
- Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION 9

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

UNIT II PLC PROGRAMMING 9

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 9

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 9

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 9

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

TEXT BOOKS

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

REFERENCES

S. No.	Author (s) Name	Title of the Book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2004
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, 5th Edition	2009

WEBSITE

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

17BEEEOE04 RENEWABLE ENERGY RESOURCES L T P C 3 0 0 3

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

UNIT I INTRODUCTION 9

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

9

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

9

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 9

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 9

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

TOTAL: 45 HOURS

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 – 3rd edition	2015

WEBSITES

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