B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM & SYLLABI 2015

(REGULAR PROGRAMME)

Department of Electrical and Electronics Engineering

FACULTY OF ENGINEERING

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed University Established Under Section 3 of

UGC Act 1956) Pollachi Main Road, Eachanari Post,

Coimbatore- 641 021,India.

B. E. ELECTRICAL AND ELECTRONICSENGINEERING

COURSE OF STUDY AND SCHEME OFEXAMINATIONS
(2015 and onwards)
SEMESTER - I

COURSE CODE	COURSETITLE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL	CONTACT HOURS /WEEK
THEORY:											
15BECC101	Communicative English – I	2	i,j,l	3	0	0	3	40	60	100	3
15BECC102	Engineering Mathematics - I	2	a,b,e,l	3	2	0	4	40	60	100	5
15BECC103	Engineering Physics	1,2	a,b,c,e,g,l	3	0	0	3	40	60	100	3
15BECC104	Engineering Chemistry	1,2	a,b,c,e,g,l	3	0	0	3	40	60	100	3
15BEEE105	Computer Fundamentals and C Programming	1	a,b,c,d,e,l	3	0	0	3	40	60	100	3
PRACTICAL:											
15BECC111	Engineering Physics and Chemistry Laboratory	1,2	a,b	0	0	3	2	40	60	100	4
15BEEE112	Computer Practice and programming Laboratory	1,2	a,c,d, e,f,j	0	0	3	2	40	60	100	4
15BEEE113	Engineering Graphics	1,2	c,d	1	0	4	3	40	60	100	5
TOTAL				**16**	**2**	**10**	**23**	**320**	**480**	**800**	**30**

VALUE ADDED COURSE

15BECC151*	Human Values	1,2	c,d,e,f	1	0	0	-	100*	-	-	1
Total Contact Hours/Week = 31 Hours											

SEMESTER - II

COURSE CODE	COURSE TITLE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
15BECC201	Communicative English – II	1,2	i,j,l	3	0	0	3	40	60	100
15BECC202	Engineering Mathematics - II	2	a,b,c,e,l	3	2	0	4	40	60	100
15BECC203	Materials Science	1,2	a,b,e,l	3	0	0	3	40	60	100
15BECC204	Environmental Studies	1	a,c,e,f,g, h,l	3	0	0	3	40	60	100
15BEEE205	Analysis of Electric Circuits	1	a,b,c,d,e,l	3	2	0	4	40	60	100
15BEEE206	Basic Mechanical Engineering	1,2	d,f	3	0	0	3	40	60	100

PRACTICAL :											
15BEEE211	Engineering Practice Laboratory	1,2	a,c,d,e,f,j	0	0	4	2	40	60	100
15BEEE212	Electric Circuits Laboratory	2	a,c,d,e,f, j,l	0	0	3	2	40	60	100
TOTAL				**16**	**4**	**10**	**24**	**320**	**480**	**800**

VALUE ADDED COURSE

15BECC251*	Elementary Biology	1,2		1	0	0	-	100*	-	-	1
Total Contact Hours/Week =30 Hours											

SEMESTER III

COURSE CODE	COURSETITLE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
15BEEE301	Methods of Applied Mathematics	1,2	a,b,c,e,l	3	2	0	4	40	60	100
15BEEE302	Electrical Machines - I	1	a,b,c,d,e,j	3	1	0	4	40	60	100
15BEEE303	Electromagnetic Theory	1	a,b,c,d,e,j	3	1	0	4	40	60	100
15BEEE304	Electronic Devices and Circuits	2	a,b,c,d,e, l	3	0	0	3	40	60	100
15BEEE305	Renewable Energy Sources	1	a,b,c,d,e,g, l	3	0	0	3	40	60	100
PRACTICAL :										
15BEEE311	Electrical Machines – I Laboratory	1	a,d,e,k,l	0	0	3	2	40	60	100
15BEEE312	Electronic Devices and Circuits Laboratory	2	a,d,e,k,l	0	0	3	2	40	60	100
15BEEE313	Introduction to Electrical System Software Laboratory	1	a,d,e,j,k,l	0	0	3	2	40	60	100
TOTAL				**15**	**4**	**9**	**24**	**320**	**480**	**800**

VALUE ADDED COURSE

15BEEE351*	YOGA/NSS	1,2	a,e,l	1	1	0	1	100	0	100

SEMESTER IV

COURSE CODE	COURSETITLE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
15BEEE401	Electrical Machines - II	1	a,b,c,d,e. g,l	3	1	0	4	40	60	100
15BEEE402	Transmission and DistributionSystems	1	a,b,c,d,e g,l	3	1	0	4	40	60	100
15BEEE403	Control System Engineering	1	a,b,c,d,e,l	3	1	0	4	40	60	100
15BEEE404	Digital Logic Circuits	2	a,b,c,e,	3	0	0	3	40	60	100
15BEEE405	Measurements and Instrumentation	1	a,b,c,d,e,l	3	0	0	3	40	60	100
PRACTICAL:										
15BEEE411	Electrical Machines Laboratory – II	1	a,b,c,d,e,l	0	0	3	2	40	60	100
15BEEE412	Scientific Computing Laboratory	2	a,b,c,e	2	0	2	3	40	60	100
15BEEE413	Control System EngineeringLaborator y	1	c,d,e,f,i,j	0	0	3	2	40	60	100
TOTAL				**17**	**3**	**8**	**25**	**320**	**480**	**800**

VALUE ADDED COURSE

15BEEE451*	Technical seminar/English communication skill development	1,2	a,b,c,d,l	1	1	0	1	100	0	100
15BEEE452*	Foreign Language (German,Japanese)/Hindi	1,2	-	1	1	0	1	100	0	100
Total Contact Hours/Week = 32 Hours										

SEMESTER V

COURSE CODE	COURSETITLE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
15BEEE501	Power Electronics	2	a,b,c,d, e,g	3	1	0	4	40	60	100
15BEEE502	Power System Analysis	2	a,d,e	3	1	0	4	40	60	100
15BEEE503	Linear Integrated Circuits	1	a,b,c,e	3	0	0	3	40	60	100
15BEEE504	Micro Processor and Micro Controller	1	a,b,c,e,h, k,l	3	0	0	3	40	60	100
15BEEE5E_ _	Department Elective-I	-	-	3	0	0	3	40	60	100
PRACTICAL :										
15BEEE511	Power Electronics and Drives Laboratory	2	a,c,d,j,k,l	0	0	3	2	40	60	100
15BEEE512	Analog and Digital Laboratory	2	a,d,e,k,l	0	0	3	2	40	60	100
15BEEE513	Measurement and Instrumentation Laboratory	1	a,d,e,j,k,l	0	0	3	2	40	60	100
TOTAL				**15**	**2**	**9**	**23**	**320**	**480**	**800**

VALUE ADDED COURSE

15BEEE551*	In plant Training	-	-	0	0	0	1	100	0	100
15BEEE552*	Mini project	1,2	-	0	0	2	1	100	0	100
Total Contact Hours/Week = 28 Hours										

SEMESTER VI

COURSE CODE	COURSETITLE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
15BEEE601	Solid State Drives	2	a,b,c,d,e, g	3	1	0	4	40	60	100
15BEEE602	Power System Opeartion and Control	2	a,b,c,d,e, g,l	3	1	0	4	40	60	100
15BEEE603	Energy Management, Utilization andAuditing	2	b,e,f,g,h, i,j	3	0	0	3	40	60	100
15BEEE604	Engineering Economics and Financial Management	1	a,c,d,g,l	3	0	0	3	40	60	100
15BEEE6E_ _	Department Elective-II	-	-	3	0	0	3	40	60	100
15BEEE6E_ _	Department Elective-III	-	-	3	0	0	3	40	60	100
PRACTICAL :										
15BEEE611	Micro Processor and Micro Controller Laboratory	2	a,c,d,j,k,l	0	0	3	2	40	60	100
15BEEE612	Power System SimulationLaboratory	1	a,c,d,j,k,l	0	0	3	2	40	60	100
TOTAL				**18**	**2**	**6**	**24**	**320**	**480**	**800**

VALUE ADDED COURSE

15BEEE651*	PCB Design	1,2	a,b,d,e,l	1	1	0	1	100	0	100
15BEEE652*	Mobile Servicing	1,2	a,b,d,l	1	1	0	1	100	0	100
Total Contact Hours/Week = 30 Hours										

SEMESTER VII

COURSE CODE	COURSETITLE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
15BEEE701	Professional Ethics	1	a,b,d,e,f, g,i	3	0	0	3	40	60	100
15BEEE702	Power System Protection and Switchgear	2	a,b,c,d,e, g,l	3	0	0	3	40	60	100
15BEEE703	Design of Electrical Apparatus	1	a,c,d,g,l	3	1	0	4	40	60	100
15BEEE7E_ _	Department Elective-IV	-	-	3	0	0	3	40	60	100
15BE_ _7OE_ _	Open Elective	-	-	3	0	0	3	40	60	100
PRACTICAL :										
15BEEE711	Control and Maintenance Laboratory	1	a,c,d,j,k,l	0	0	3	2	40	60	100
15BEEE712	Electrical Estimation and Rewinding Laboratory	1,2	a,c,d,e,f,g	0	0	3	2	40	60	100
15BEEE713	Electrical Drives Laboratory	1,2	a,c,e	0	0	3	2	40	60	100
TOTAL				**15**	**1**	**9**	**22**	**320**	**480**	**800**

VALUE ADDED COURSE

15BEEE751*	Programmable Logic Controller(PLC)	1,2	a,b,d,e,l	1	1	0	1	100	0	100
15BEEE752*	ETAP and PSCAD	1,2	a,b,d,e,l	1	1	0	1	100	0	100
Total Contact Hours/Week = 29 Hours										

SEMESTER VIII

COURSE CODE	COURSETITLE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
15BEEE8E_ _	Department Elective-VI	-	-	3	0	0	3	40	60	100
15BEEE8E_ _	Department Elective-VII	-	-	3	0	0	3	40	60	100
15BEEE8E_ _	Department Elective-VIII	-	-	3	0	0	3	40	60	100
PRACTICAL :										
15BEEE891	Project work and Viva-Voce	1,2	-	0	0	24	12	120	180	300
TOTAL				**9**	**0**	**24**	**21**	**240**	**360**	**600**
Total Contact Hours/Week = 33 Hours										

L:LectureHour T:Tutorial Hour CIA:
P:PracticalHour C: No.ofCredits ESE: End SemesterExamination V A C: Value AddedCourse

Total Credits earned: 23+24+22+22+23+22+21+22=179
against the specified range –[175-190 Credits]
* Credits for **Mandatory Courses (MC)** are not counted for computation of CGPA.The passing minimum for **Mandatory Courses (MC)** is 50 marks out of 100 Marks.There will be two tests, of which one will be class test covering 50% of syllabus for 50 marks and other class test covering next 50% of syllabus for 50 marks.[Total 50+50=100Marks].
Interested students can opt one self study course in the Seventh semester from open electives which will be reflected in the mark sheets, only if he/she passes in the course.

S. No	SUB. CODE	TITLE OF THE COURSE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
ELECTIVE-I V SEMESTER											
1	15BEEE5E01	Network Analysis and Synthesis	2	a,d,e	3	0	0	3	40	60	100
2	15BEEE5E02	Advanced Control System	2	b,c,h,i	3	0	0	3	40	60	100
3	15BEEE5E03	Power Plant Engineering	2	c,d,e,g,h,i	3	0	0	3	40	60	100
4	15BEEE5E04	Communication Engineering	1	-	3	0	0	3	40	60	100
5	15BEEE5E05	Introduction to Neural Networks	1	a,c,e,g,l	3	0	0	3	40	60	100
ELECTIVE-II AND ELECTIVE-III VI SEMESTER											
6	15BEEE6E01	Computer Architecture	1	a,c,e	3	0	0	3	40	60	100
7	15BEEE6E02	Fuzzy Logic and its applications	1	a,c,e,n	3	0	0	3	40	60	100
8	15BEEE6E03	Distributed Generation	2	c,d,e,g,h,i	3	0	0	3	40	60	100
9	15BEEE6E04	Computer Organization andArchitecture	1	a,c,e	3	0	0	3	40	60	100
10	15BEEE6E05	Embedded System	1	-	3	0	0	3	40	60	100
11	15BEEE6E06	Programmable Logic Controller and its Application	1,2	a,b,d,e,l	3	0	0	3	40	60	100
12	15BEEE6E07	Digital Signal Processing	1	a,b,c,d,e,g,l,m	3	0	0	3	40	60	100
13	15BEEE6E08	High Voltage Engineering	2	a,b,c,d,e,g,l	3	0	0	3	40	60	100
14	15BEEE6E09	Special Electrical Machines	2	a,c,d,e,h	3	0	0	3	40	60	100
15	15BEEE6E10	Fibre Optics and Laser Instruments	1	a,b,e,k,l,m	3	0	0	3	40	60	100
ELECTIVE-IV AND ELECTIVE-V VII SEMESTER											
16	15BEEE7E01	Computer Networks	1	a,c,e	3	0	0	3	40	60	100
17	15BEEE7E02	Mobile Communication	1	a,b,d,e	3	0	0	3	40	60	100
18	15BEEE7E03	Artificial Intelligence and Expert Systems	2	a,c,e	3	0	0	3	40	60	100
19	15BEEE7E04	Power System Transients	2	b,d,e	3	0	0	3	40	60	100
20	15BEEE7E05	Sensor and Transducer	1	a,b,c,e,i	3	0	0	3	40	60	100
21	15BEEE7E06	HVDC and EHVAC	2	a,b,c,h,i,l	3	0	0	3	40	60	100
22	15BEEE7E07	Switched Mode Power Conversion	2	a,c,e	3	0	0	3	40	60	100
23	15BEEE7E08	Power System Restructure	2	a,c,e,j,k,l	3	0	0	3	40	60	100
24	15BEEE7E09	PLC and Industrial Automation	1,2	a,b,d,e,l,m,n	3	0	0	3	40	60	100
25	15BEEE7E10	Microcontroller Based System Design	1	a,b,c,h,i,l	3	0	0	3	40	60	100

ELECTIVE-VI AND ELECTIVE-VII VIII SEMESTER											
26	15BEEE8E01	Electric Hybrid Vehicle	2	a,c,d,h,m,n	3	0	0	3	40	60	100
27	15BEEE8E02	Smart Grid	2	a,b,c,h,i,l	3	0	0	3	40	60	100
28	15BEEE8E03	Flexible AC Transmission Systems	2	a,b,c,e,j,l	3	0	0	3	40	60	100
29	15BEEE8E04	Power Generation Economics	2	a,c,e	3	0	0	3	40	60	100
30	15BEEE8E05	Total Quality Management	1	b,e,f,g,h,i,j	3	0	0	3	40	60	100
31	15BEEE8E06	Intellectual Property Rights	1	h,j,l	3	0	0	3	40	60	100
32	15BEEE8E07	Power Quality	2	a,c,d,e,h,l	3	0	0	3	40	60	100
33	15BEEE8E08	Biomedical Instrumentation	1,2	a,c,d,e,f,m,n	3	0	0	3	40	60	100
34	15BEEE8E09	Industrial Automation	1	a,c,d,e,k,m, n	3	0	0	3	40	60	100
35	15BEEE8E10	Computer Aided Analysis and Design of Electrical Apparatus	1	a,c,d,g	3	0	0	3	40	60	100
36	15BEEE8E11	Power System Dynamics	2	a,c,e	3	0	0	3	40	60	100
37	15BEEE8E12	VLSI Design	2	a,b,c,f,g	3	0	0	3	40	60	100
38	15BEEE8E13	Power Generation Systems	2	c,d,e,g,h,i	3	0	0	3	40	60	100
39	15BEEE8E14	Modern semi conductorDevices	2	a,c,d,e,g	3	0	0	3	40	60	100
40	15BEEE8E15	Optimisation Techniques	2	a,c,e	3	0	0	3	40	60	100
41	15BEEE8E16	Real Time OpeartingSystem	1	a,c,e.j.l,n	3	0	0	3	40	60	100
42	15BEEE8E17	Advances in Soft Computing	1	a,c,e	3	0	0	3	40	60	100
43	15BEEE8E18	Digital System Design using VHDL	1	a,c,e,h,l	3	0	0	3	40	60	100
44	15BEEE8E19	Virtual Instrumentation	1	a,b,e,h,l,m,n	3	0	0	3	40	60	100

List of Open Electives offered by Other Departments Science & Humanities										
SUB. CODE	**TITLE OF THECOURSE**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
15BESHOE01	Industrial Mathematics I	1,2	a,c,d,h,j	3	0	0	3	40	60	100
15BESHOE02	Industrial Mathematics II	1	a,b,c	3	0	0	3	40	60	100
15BESHOE03	Probability and Random Process	1	a,g,h,j	3	0	0	3	40	60	100
15BESHOE04	Probability and Statistical Methods	1,2	a,b, g,h,j	3	0	0	3	40	60	100
15BESHOE05	Probability and Queuing Theory	1, 2	a,b,c,g	3	0	0	3	40	60	100
15BESHOE06	Fuzzy Mathematics	1,2	a,b,c,	3	0	0	3	40	60	100
15BESHOE07	Mathematical Physics	1,2	a,b,c,d, g,h,j	3	0	0	3	40	60	100

15BESHOE08	Advanced Engineering Mathematics	1	a,b,c	3	0	0	3	40	60	100
15BESHOE09	Linear Algebra	1	a,b,c,h,j	3	0	0	3	40	60	100
15BESHOE10	Transforms and Partial Differential Equations	1	a,b,c,h,j	3	0	0	3	40	60	100
15BESHOE11	Technical Writing	1,2	a,c,d,h,j	3	0	0	3	40	60	100
15BESHOE12	Geophysics	1	a,b,c	3	0	0	3	40	60	100
15BESHOE13	Engineering Acoustics	1	a,g,h,j	3	0	0	3	40	60	100
15BESHOE14	Alternate Fuels and Energy Systems	1	a,g,h,j	3	0	0	3	40	60	100
15BESHOE15	Solid Waste Management	1,2	a,b, g,h,j	3	0	0	3	40	60	100
15BESHOE16	Green Chemistry	1, 2	a,b,c,g	3	0	0	3	40	60	100
15BESHOE17	Applied Electrochemistry	1, 2	a,b,c,g	3	0	0	3	40	60	100
15BESHOE18	Industrial Chemistry	1, 2	a,b,c,g	3	0	0	3	40	60	100
Computer Science Engineering										
15BECSOE01	Python Programming	1,2	a,b,c ,d,	3	0	0	3	40	60	100
15BECSOE02	Internet Programming	1,2	a,b,c ,g,h	3	0	0	3	40	60	100
15BECSOE03	Multimedia and Animation	1,2	a,b,c ,g,h,j	3	0	0	3	40	60	100
15BECSOE04	PC Hardware and Trouble shooting	1	a,b,c ,d ,j	3	0	0	3	40	60	100
15BECSOE05	Game Programming	1,2	a,b,c ,d,	3	0	0	3	40	60	100
Electronics and Communication Engineering										
15BEECOE01	Real Time Embedded Systems	1,2	a,b,c,d	3	0	0	3	40	60	100
15BEECOE02	Consumer Electronics	1	a,b,c,,j	3	0	0	3	40	60	100
15BEECOE03	Fundamentals of Nanotechnology	1,2	a,d,g,h,j	3	0	0	3	40	60	100
15BEECOE04	Image &Video Processing	1	a,b,c,d	3	0	0	3	40	60	100
15BEECOE05	VLSI Technology	1,2	a,b,d	3	0	0	3	40	60	100
15BEECOE06	Fundamentals of MEMS	1,2	a,b,d	3	0	0	3	40	60	100
15BEECOE07	Neural Networks and its Applications	1	a,b,c,d	3	0	0	3	40	60	100
15BEECOE08	Fuzzy Logic and its Applications	1	a,c,e	3	0	0	3	40	60	100
Bio Technology										
15BTBTOE01	Bioreactor Design	1,2	a,b,c,	3	0	0	3	40	60	100
15BTBTOE02	Food Processing and Preservation	1,2	a,b,d	3	0	0	3	40	60	100
15BTBTOE03	Molecular Modeling	1	a,b,c,	3	0	0	3	40	60	100
15BTBTOE04	Bioremediation	2	a,b,c,d, g,h,j	3	0	0	3	40	60	100
15BTBTOE05	Biophysics	1,2	a,b,c,	3	0	0	3	40	60	100
15BTBTOE06	Basic Bioinformatics	1,2	a,b,d	3	0	0	3	40	60	100

15BTBTOE07	Fundamentals of Nano Biotechnology	1	a,b,c,	3	0	0	3	40	60	100
Mechanical Engineering										
15BEMEOE01	Introduction to MEMS	1	a,b,c ,d	3	0	0	3	40	60	100
15BEMEOE02	Robotics	1	a,b,d ,g	3	0	0	3	40	60	100
15BEMEOE03	Industrial Safety and Environment	1,2	a,b,c ,d	3	0	0	3	40	60	100
15BEMEOE04	Transport Phenomena	1,2	a,b,c ,d,g, h,j	3	0	0	3	40	60	100
15BEMEOE05	Introduction to Biomechanics	1,2	a,b,c ,d	3	0	0	3	40	60	100
Automobile Engineering										
15BEAEOE01	Automobile Engineering	1,2	a,b,d, g	3	0	0	3	40	60	100
15BEAEOE02	Basics of Two and Three Wheelers	1,2	a,b,d,	3	0	0	3	40	60	100
15BEAEOE03	Automobile Maintenance	1	a,b,c	3	0	0	3	40	60	100
15BEAEOE04	Introduction to Modern Vehicle Technology	1,2	a,b,c	3	0	0	3	40	60	100
Civil Engineering										
15BECEOE01	Housing, Plan and Management	1,2	a,b,c,d	3	0	0	3	40	60	100
15BECEOE02	Building Services	1,2	a,b,c,d	3	0	0	3	40	60	100
15BECEOE03	Coastal Zone Management	1,2	a,b,d	3	0	0	3	40	60	100
15BECEOE04	Experimental Method and Model Analysis	1	a,b,c	3	0	0	3	40	60	100
15BECEOE05	Management of Irrigation Systems	1,2	a,b,c,d	3	0	0	3	40	60	100
15BECEOE06	Computer Aided Design of Structure	1,2	a,b,d	3	0	0	3	40	60	100
15BECEOE07	Pavement Engineering	1,2	a,b,d	3	0	0	3	40	60	100
15BECEOE08	Rock Engineering	1,2	a,b,c,d	3	0	0	3	40	60	100
15BECEOE09	Storage Structures	1,2	a,b,d	3	0	0	3	40	60	100
15BECEOE10	Wind Engineering	1,2	a,b,c,d	3	0	0	3	40	60	100
15BECEOE11	Advanced Construction Technology	1	a,b,c	3	0	0	3	40	60	100
List of Electives Offered to Other Departments Electrical and Electronics Engineering										
15BEEEOE01	Electric Hybrid Vehicle	2	a,c,d ,h,m, n	3	0	0	3	40	60	100
15BEEEOE02	Energy Management and Energy Auditing	2	b,e,f,g, h,i,j,n	3	0	0	3	40	60	100
15BEEEOE03	Sensors & Transducers	1	a,b,c,e	3	0	0	3	40	60	100

			,i							
15BEEEOE04	Programmable Logic Controller	1, 2	a,b, d,e,l	3	0	0	3	40	60	100
15BEEEOE05	Renewable Energy Sources	1	a,b,c,d, e,g,l	3	0	0	3	40	60	100
15BEEEOE06	Advanced Control Systems	2	b,c,h,i	3	0	0	3	40	60	100

**--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 computationalplatforms.
PEO 2	Engross in life long process of learning to keep themselves abreast of new developments in the field of Electronics and their applications in power engineering

MAPPING

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

SEMESTER – I

15BECC101 COMMUNICATIVE ENGLISH – I 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

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

Unit I 9

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

Unit II 10

Listening – Understanding the passage in English –Pronunciation practice. **Speaking** – Asking and answering questions - Telephone etiquette. **Reading** – Critical reading – Finding key information in a given text (Skimming - Scanning). **Writing** – Coherence and cohesion in writing – Short paragraph writing – Letters to the Editor. **Grammar** – Parts of speech – Noun – Verb – Adjectives - Adverbs. **Vocabulary** – Compound Nouns/Adjectives – Irregular verbs.

Unit III **10**

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

Unit IV **8**

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) – Formal and Informal letters. **Grammar** – Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

Unit V **8**

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

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

TOTAL: 45 HOURS

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

15BECC102 ENGINEERING MATHEMATICS I L T P C 3 2 0 4

Course Objectives:

- To develop analysing skills for solving different engineering problems.
- To understand the concept of Matrices, Sequence and Series.
- To remember the basics of differential calculus and its applications.
- To Create knowledge about Hyperbolic functions, Beta and Gamma functions.
- To apply the problems in differential equations.
- To study the algebraic manipulation

Course Outcomes:

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

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

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

UNIT III SEQUENCES AND SERIES 13

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

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 DIFFERENTIAL EQUATIONS 11

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

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

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	Bhaskar Rao. P. B, Sri Ramachary SKVS, Bhujanga Rao. M	Engineering Mathematics I	**BS Publications, India.**	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
4	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009
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

15BECC103 ENGINEERING PHYSICS L T P C 3 2 0 4

Course Objectives:

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

Course Outcomes:

- 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), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bending.

Concept of entropy- change of entropy in reversible and irreversible processes –refrigeration.

UNIT II LASER AND FIBER OPTICS 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 – Compton effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electron microscope.

UNIT IV CRYSTAL PHYSICS 9

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

UNIT V ULTRASONICS AND NUCLEAR PHYSICS 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, nuclear composition –Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

TOTAL: 45 HOURS

TEXT BOOK

S.No	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641 001	2nd Edition-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	8th Edition 2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	Dhanpat Rai Publications,New Delhi.	9th Edition 2011

WEBSITES

1. www.nptel.ac.in
2. www.physicsclassroom.com

3. www. oyc.yale.edu
4. www.physics.org

15BECC104 ENGINEERING CHEMISTRY L T P C 3 0 0 3

Course Objectives:

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

Course Outcomes:

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

UNIT I WATER TECHNOLOGY 9

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

UNIT II ELECTROCHEMISTRY AND STORAGE DEVICES 9

Electrochemical cells – Reversible and irreversible 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.

UNIT III FUELS AND ROCKET PROPELLANTS 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, An introduction to Fuel Cell, H_2-O_2 Fuel Cell -Rocket engines-Types of rocket engines, Basic principles, Mass fraction.

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 - Paints - Constituents and functions –- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating and Hot dipping.

UNIT V SURFACE CHEMISTRY 9

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm-Industrial adsorbent materials- Role of adsorbents in catalysis and water softening-Emulsion-Types-water/oil, oil/water- Applications of adsorption.

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

- http://www.studynotes.ie/leaving-cert/chemistry/
- http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html

- http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
- http://ocw.mit.edu/courses/#chemistry
- http://www.chem.qmul.ac.uk/surfaces/sec

15BEEE105 COMPUTER FUNDAMENTALS AND C PROGRAMMING L T P C 3 0 0 3

Course Objectives

Students will

- Identify and understand the working of key components of a computer system.
- Identify and understand the various kinds of input-output devices
- Study different types of storage media commonly associated with a computer.
- Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure.
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language
- Study the real type application of it.

Course Outcomes

Students will

- Write small programs related to simple/ moderate mathematical
- Write small programs related to logical problems in 'C'.
- Study, analyze and understand simple data structures and how to use it in C language
- Identify and understand the working of different operating systems like windows and Linux etc.
- Analysis the real time application of it
- Write small programs related to project works

UNIT I OVERVIEW OF COMPUTER 8

What is computer- Computer Components-Generation of Computers- Memory Organization-Memory Types-Input and Output Devices- Concepts of Hardware and Software- What is OS-Windows and Unix OS- Programming Languages- Basics of Computer Networks- LAN, WAN-Concept of Internet- ISP- Basics of word processing- Basics of spreadsheet – Basics of presentation Software

UNIT II OVERVIEW OF 'C' 8

Algorithms-Representation of Algorithms-Flowchart- Introduction to programming Languages-What is C- C Character set- Constants, Variables and Keywords-General form of C Program-The First C Program-Data types-Arithmetic Instructions- Type conversions- Relational and Logical Operators-Hierarchy and associativity

UNIT III SELECTION AND ITERATION 9

Selection Structures- If and nested if - Loops-Definition and types-While loop-for loop- do-while loop- break and continue- Nested loops- Advantages of iteration-Menu driven programs-Switch Case

UNIT IV FUNCTIONS 10

Functions- Definition-types-Functions without arguments- Functions with Input arguments-Functions with output parameters-local and global variables- advantages of functions- Call by value and Call by reference- Recursion- Function as an argument

UNIT V ARRAYS AND STRINGS 10

Arrays-definition- Declaring and referencing arrays- Array initialization- Using for loops for accessing arrays-Passing array elements as function arguments-2D Array - Matrix Addition and multiplication- Introduction to Strings- declaration and Initialization--String constant -Strings as Array of Characters

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
3.	H. M. Deitel and D. J. Deitel	C: How to Program	Prentice Hall, 7th Edition	2012
4.	E. Balagurusamy	Programming in ANSI C	TMH Education, 6th edition	2012

15BECC111 ENGINEERING PHYSICS AND CHEMISTRY LABORATORY L T P C 0 0 3 2

ENGINEERING PHYSICS

Course Objectives

- 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 – Carey Foster Bridge

ENGINEERING CHEMISTRY

Course Objectives

- 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.Familiarize the properties of material and basic concepts in chemistry
2.Get experience in argentometric method experimentation
3.Get practical exposure to analyse the water sample
4.Get knowledge in spectrophotometry
5.Acquire knowledge about different crystal formation in water
6.Practical knowledge in determine the chemical oxygen demand

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_2SO_4.
8. pH Titration (acid & base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$).
10. Estimation of Ferric iron 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

15BEEE112 COMPUTER PRACTICE AND PROGRAMMING LABORATORY
L T P C 0 0 3 2

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.

LIST OF EXPERIMENTS

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

TOTAL: 45 HOURS

15BEEE113 ENGINEERING GRAPHICS L T P C 1 0 4 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 (3 +10)

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 (3 + 10)

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 (3 + 12)

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

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

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

UNIT V PROJECTION OF SOLID (3 + 12)

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

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

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

TOTAL: 75 HOURS

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

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1.	Kumar M S	Engineering Graphics	D D Publications, Chennai, Ninth Edition	2007
2.	Bureau of Indian Standards	Engineering Drawing Practices for Schools and Colleges SP 46	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.

Course Objectives

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

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

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

4.To know the value of being a human being and the value of being a useful citizen.

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

6.To know the self exploration and meaning of life

Course Outcomes

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

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

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

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

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

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

UNIT I **4**

Human life on Earth - Concept of Human Values - Value Education - Aim of education and value education - Types of values - Components of values – Attitudes – types of attitudes

UNIT II **4**

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

UNIT III **5**

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

UNIT IV **4**

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

UNIT V **3**

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

TOTAL: 20 HOURS

REFERENCES

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

1	Subramanian. R	Professional Ethics	Oxford, New Delhi	2013
2	Govindarajan. M, Natarajan. S, Senthil Kumar. V.S	Engineering Ethics	Prentice Hall of India, New Delhi	2004
3	Tripathi. A.N	Human Values	New Age International	2009
4	Pope. G. U.	Thirukkural with English Translation	Uma Publication, Thanjavur.	2002

15BECC201 COMMUNICATIVE ENGLISH-II L T P C 3 0 0 3

Course Objectives

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

Course Outcomes

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

UNIT 1 **10**

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

UNIT II **8**

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

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

UNIT IV **8**

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

UNIT V **10**

Listening – Types of listening- Improving listening comprehension**. Speaking** - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., **Reading** -Note making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation writing – Short essays writing- **Grammar**- Transformation of sentences (Simple, Compound & Complex). **Vocabulary** - Collection of Technical Vocabularies with their meanings.
Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

TOTAL: 45 HOURS

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

15BECC202 **ENGINEERING MATHEMATICS II** **L T P C 3 2 0 4**

Course Objectives:

- To understand the concepts and applications of partial differential equations
- Determine mathematical tools needed in evaluating multiple integrals and their usage.
- Utilize Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.
- 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.
- 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.
- To study complex integration.

Course Outcomes:

- The student will be able to Understand how to solve the given standard partial differential equation
- The students will be able to understand mathematical tools needed in evaluating multiple integra and their usage. Find the areas and volumes using multiple integrals
- To calculate with them and apply them and also to calculate grad, div and curl in Cartesian and oth simple coordinate systems.
- Improve their ability in Vector calculus
- 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 function They will understand relations between conformal mappings and quadratic differentials and how geometric structures are changing under conformal mappings.
- 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 PARTIAL DIFFERENTIAL EQUATIONS **11**

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

UNIT-II MULTIPLE INTEGRALS **11**

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

UNIT-III VECTOR CALCULUS **13**

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

UNIT-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, $1/z$, z^2 and bilinear transformation.

UNIT-V COMPLEX INTEGRATION **13**

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

15BECC203 MATERIALS SCIENCE **L T P C 3 0 0 3**

Course Objectives

- To enrich the understanding of various types of materials and their applications in engineering and technology
- Introduce the concepts of classical and quantum electron theories for diverse applications.
- Understand the basics of magnetic materials and its properties.
- Impart the basic knowledge of superconducting and dielectric materials.
- Inculcate the technology in synthesisation of Nano materials.
- To know about polarization techniques

Course Outcomes

- Explain the ideas of classical and quantum electron theories and energy band structures.
- Illustrate the basics of semiconductor physics and its related concepts.
- Compare the different magnetic materials, its properties and infer its role in various fields.
- Identify the properties of superconducting materials and its engineering applications.
- Extend the various polarization techniques and applications of dielectric materials.
- Summarize the basics of nano structures and synthesizing techniques

UNIT I CONDUCTING MATERIALS **9**

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS **9**

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIAL **9**

Origin of magnetic moment – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications.

Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Temperature superconductors – Applications of superconductors – magnetic levitation.

UNIT IV DIELECTRIC MATERIALS **9**

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – Applications of dielectric materials – ferroelectricity and applications.

UNIT V ADVANCED MATERIALS **9**

Metallic glasses: preparation, properties and applications .Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, applications. Composite materials, Aircraft materials and non-metallic materials.

Nano materials: synthesis – Physical and chemical vapour deposition – ball milling - properties of nanoparticles and applications. Carbon nanotubes: structure – properties and applications.

TOTAL: 45 HOURS

TEXT BOOK

S.No	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Ganesan.S and Baskar.T	Engineering Physics II	GEMS Publisher, Coimbatore-641 001	2^{nd} Edition-2015

REFERENCES

S.No	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	William D Callister Jr	Material Science and Engineering-An Introduction	John Wiley & Sons Inc., New York.	9^{th} Edition 2013
2	James F Shackelford	Introduction to Materials Science for Engineers	Macmillan Publication Company, New York	8^{th} Edition 2014

3	Charles Kittel	Introduction to Solid State Physics	John Wiley & sons, Singapore.	8th Edition 2005

WEBSITES

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

15BECC204 ENVIRONMENTAL STUDIES L T P C 3 0 0 3

Course Objectives:

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

Course Outcomes (COs)

- To give a comprehensive insight into natural resources, ecosystem and biodiversity.
- To educate the ways and means of the environment
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures
- To impart knowledge on ecosystem and biodiversity.
- To analysis the real time application of it

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- Genetic diversity, 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

FromUnsustainable to Sustainable development, Urban problems related to energysources,Water co nservation, 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 Science Demystified	Mapin Publishing (P) Ltd., Ahmedabad.	2005
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/

15BEEE205 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
  Apply network theorems for the analysis of electrical circuits.
- Obtain the solution of first and Second order system
- Analyse the electrical circuits using Laplace Transforms.
- Obtain the transient and steady-state response of electrical circuits.
- Analyse circuits in the sinusoidal steady-state (single-phase and three-phase).
- Analyse two port circuit behavior.

UNIT I DC CIRCUIT ANALYSIS 12

Definition of voltage, current, power - Ohm's law and Kirchhoff's Laws – Classification of network elements – R, L, C parameters – Energy sources – series parallel circuits - Star-delta transformation - Mesh and nodal methods -source transformations.

UNIT II DC NETWORK THEOREMS 12

Superposition theorem – Thevenin's and Norton's theorems - Maximum power transfer theorem - Reciprocity theorem.

UNIT III AC CIRCUIT ANALYSIS 12

AC generations- complex operator – Voltage and current sources - Form Factor and Peak Factor for different patterns of alternating waveforms - Phase relation in R, L & C - Real, reactive and apparent powers-Power factor – Impedance diagram – phasor diagram – Series circuits – Parallel circuits – Compound circuits.

UNIT IV COUPLED CIRCUITS AND TRANSIENTS (Qualitative treatment only) 12

Introduction to coupled circuits – Mutual inductance – Coefficient of coupling - Ideal transformer - Dot rule - Transient response –DC response of RL, RC, R L C circuits – Sinusoidal response of RL, RC, RLC circuits.

UNIT V POLYPHASE CIRCUITS 12

Three phase system(Star, Delta connections) – advantages- interconnection of three- phase sources and loads - balanced and unbalanced 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

15BEEE206 BASIC MECHANICAL ENGINEERING L T P C 3 0 0 3

Course Objectives

- To study the basic theorems used in mechanical engineering.
- To study the fundamentals of manufacturing process and machine tools.
- To study the principles of heat transfer.
- To study the different types of machine tools
- To study the energy conservation devices
- To know about the application of it

Course Outcomes

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

INTRODUCTION (Not included for examination) 2

Engineering and Technology - History of Mechanical Engineering- Mechanics - Statics and dynamics - Broad areas in Mechanical Engineering.

UNIT I MANUFACTURING PROCESSES 9

FOUNDRY - Principles - Patterns - Types, Molding Processes, Cupola and Induction Furnaces. METAL FORMING - Principles - Hot and cold working of metals - Forging, rolling, extrusion and wire drawing, sheet metal operations. WELDING - Principles - Oxy-Acetylene Welding and Manual Metal Arc Welding, Brazing and Soldering.

UNIT II MACHINE TOOLS 8

Machining principles - Construction and working principles of basic machine tools - Lathe, Drilling, Shaper, Planer and Milling machine.

UNIT III ENERGY CONVERSION DEVICES (Theoretical study using schematic diagrams only) **8**

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.

UNIT IV THERMODYNAMICS BASICS AND REFRIGERATION 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 and Second law of thermodynamics. 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 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.

TOTAL: 45 HOURS

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Venugopal K. and Prahu Raja V. G. Sreekanjana	Basic Mechanical Engineering	Anuradha Publishers, Kumbakonam	2013
2	Shantha Kumar S R J	Basic Mechanical Engineering	Hi-tech Publications, Mayiladuthurai	2000
3	Nag P K	Engineering Thermodynamics	Fifth Edition", Tata McGraw-Hill, New Delhi	2013

15BEEE211 ENGINEERING PRACTICE LABORATORY L T P C 0 0 3 2

Course Objectives

- To provide exposure to the students with hands on experience on various basic engineering practices .
- To provide exposure to the students with hands on experience on various basic engineering practices in Civil Engineering.
- To provide exposure to the students with hands on experience on various basic engineering practices in Mechanical Engineering.
- To provide exposure to the students with hands on experience on various basic engineering practices in Electrical Engineering.
- To provide exposure to the students with hands on experience on various basic engineering practices in Electronics Engineering.
- To get the knowledge about application of it

Course Outcomes

- To understand various basic engineering practices in Civil Engineering
- To understand various basic engineering practices in Mechanical Engineering.
- To understand various basic engineering practices in Electrical Engineering.
- To understand various basic engineering practices in Electronics Engineering.
- To analysis the real time application of it
- To understand the different process in the industry

PART – A (CIVIL & MECHANICAL)

i. WELDING **6**

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

ii. BASIC MACHINING **6**

i. Simple Turning and Taper turning
ii. Drilling and Tapping

iii. SHEET METAL WORK **6**

i. Model making – Trays, funnels, etc.

iv. DEMONSTRATION ON **4**

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

PART –B (ELECTRICAL & ELECTRONICS)

v. ELECTRICAL ENGINEERING **10**

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

v. Measurement of energy using single phase energy meter.

vi. ELECTRONICS ENGINEERING **(13)**

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

TOTAL: 45 HOURS

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

15BEEE212 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)

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

LIST OF EXPERIMENTS

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

15BECC251 ELEMENTARY BIOLOGY L T P C 1 1 0 1

Course Objectives:

- To give a basic knowledge on biology to all the students from various academic backgrounds
- To study about basics of cell biology
- To study about biomolecules
- To study about human anatomy
- To study about genetic disorders
- To study about recent trends

Course Outcomes

- To understand the basics of biomoleculeshuman anatomy and physiology
- To understand the anatomy
- To understand the physiology
- To get knowledge about genetic disorders
- To get knowledge about human anatomy
- To have better understanding of advancements in biology

UNIT-I BASICS OF CELL BIOLOGY 4

History, Cell theory, Cell Structure-Prokaryotic and Eukaryotic cells, Animal and Plant Cell. Cell cycle, Mitosis, Meiosis and Reproductive cycle.

UNIT-II BIOMOLECULES 4

Carbohydrates-Classification, Qualitative tests for sugars, Lipids-Definition, Classification; Proteins- classification and functions; Nucleic acids-basic structure; Hormones-definition, importance; Vitamins.

UNIT-III HUMAN ANATOMY AND PHYSIOLOGY 5

Levels of Structural organization, the eleven systems of human body, central nervous system- cardiovascular system and immune system.

UNIT-IV GENETICS AND GENETIC DISORDERS 4

History of genetics-Scope and Importance of genetics, Mendel and his work, DNA stores genetic information- gene mutation, disorders due to mutant genes.

UNIT-V TECHNOLOGICAL ADVANCES IN BIOLOGY 3

Biopharmaceuticals, Gene therapy, genetically modified crops, probiotics.

TOTAL: 20 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Verma, P. S., Agarwal, V. K.	Cell Biology, Genetics, Molecular Biology, Evolution and Ecology	S. Chand &Company Ltd.,New Delhi	2006

REFERENCES

S.No	Author(S) Name	Title of the Book	Publisher	Year of Publications
1	Nelson, D. L. and Cox, M. M	LehningerPrinciples of Biochemistry 4th Edition	Freeman, W. H. & Company, New york	2004
2	Tortora, G. J., Derrickson, B	Principles of Anatomy and Physiology, 11thEditioh	John Wiley & Sons, New York	2006

WEBSITE

1. http://www.biotechonweb.com/Application-of-biotech-in-Medical.html

SEMESTER III

15BEEE301 METHODS OF APPLIED MATHEMATICS L T P C 3 2 0 4

Course Objectives:

- To hone the analytical skills in the minds of Engineers.
- To provide sound foundation in the mathematical fundamentals necessary to formulate, solve and analyze Engineering problems.
- To study the fourier series
- To study the basic principles of different transforms.
- To study the application of PDE
- To study the difference equations

Course Outcomes:

Upon Completion of this course the students will be ableto:

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

UNIT I 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 10

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

TOTAL : 60HOURS

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

15BEEE302 **ELECTRICAL MACHINES I** **L T P C 3 1 0 4**

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 study the 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 three phase transformers circuits.

UNIT I DC GENERATORS **12**

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

UNIT II DC MOTORS **12**

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

UNIT III TESTING OF DC MACHINES **12**

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

UNIT IV SINGLE PHASE TRANSFORMER **12**

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 test.

UNIT V THREE PHASE TRANSFORMER **12**

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.

TOTAL: 60 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	2007

REFERENCES

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

WEBSITE

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

15BEEE303 ELECTROMAGNETIC THEORY L T P C 3 1 0 4

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 12

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

UNIT II ELECTROSTATICS 12

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 12

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 12

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 12

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

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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	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Nagrath, I.J., Kothari D.P	Electric machines	Tata McGraw Hill publishing Co Ltd., New Delhi	2004
2	Kraus and Fleish	Electromagnetics with Applications	5th edition, McGraw Hill international edition	2010
3	Sadiku	Elements of electromagnetics	6th edition, 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.htm

15BEEE304 ELECTRONIC DEVICES AND CIRCUITS L T P C 3 0 0 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 MISELLANEOUS DEVICES 9

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

UNIT V OSCILLATORS AND PULSE CIRCUITS 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- varactor diode, tunnel diode -LDR, LEDs, LCDs.

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.	2003
2	Allen Mottershead	Electronic Devices and Circuits – An Introduction	Prentice Hall of India Private Limited, New Delhi.	2003
3	David A. Bell	Electronic Devices and Circuits	Prentice Hall of India, New Delhi.	2003

REFERENCES

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

17BEEE304 ELECTRONIC DEVICES AND CIRCUITS 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 ications in theUS,and the world.
- Describe the challenges and problems associated with the use of various energy ces, including fossil fuels, with regard to future supply and the environment.
- Discuss remedies/potential solutions to the supply and environmental issues ciated 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 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 –Ful cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL: 45 HOURS

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

REFERENCES

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

WEBSITES

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

15BEEE311 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

15BEEE312 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.

15BEEE313 INTRODUCTION TO ELECTRICAL SYSTEM SOFTWARE LABORATORY

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.

SEMESTER IV

15BEEE401 ELECTRICAL MACHINES II L T P C 3 1 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 - 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 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	Theraja B. L and Theraja A. K	A Textbook of Electrical Technology	Vol. II, S Chand & Co. Ltd., New Delhi	2009

REFERENCES

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

WEBSITES

1. www.classle.net/sites/default/files/text/68781/2_2_0.pdf

2. www.gtbit.org/downloads/emecsem3/emecsem3n4qbank.pdf

15BEEE402 TRANSMISSION AND DISTRIBUTION SYSTEMS L T P C 3 1 0 4

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 neighbouring communication circuits. Typical configuration, conductor types and electrical parameters of 400, 220, 110, 66 and 33 kV lines.

UNIT III MODELING AND PERFORMANCE OF TRANSMISSION LINES 12

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

UNIT IV INSULATORS AND CABLES **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	2003
2	Central Electricity Authority (CEA)	Guidelines for Transmission System Planning	Tamil Nadu Electricity Board	2003
3	Colin Bayliss and Brian Hardy	Transmission and Distribution Electrical Engineering	Elsevier, Newnes	2007

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	2003
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	2002

WEBSITE

http://www.adamiano.com/

15BEEE403 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 1

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, New Delhi	2003
2	Nagrath & Gopal	Control System Engineering	New Age International Edition, New Delhi.	2002

REFERENCES

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

15BEEE404 DIGITAL LOGIC CIRCUITS L T P C 3 0 0 3

Course Objectives

- To introduce the fundamentals of Digital Circuits, combinational and sequential circuits.
- To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.
- To study the implementation of combinational circuits
- To study the design of various synchronous and asynchronous circuits.
- To expose the students to various memory devices.
- To study the application of it

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 and state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Analysis of asynchronous sequential machines, state assignment and asynchronous design problem – Hazards.

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	Morris Mano, M.	Digital Logic and Computer Design	Prentice Hall of India, New Delhi.	2002

2	Charles H Roth	Fundamentals Logic Design	Jaico Publishing, New Delhi.	2002

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Floyd, L.	Digital Fundamentals	Pearson Education, New Delhi.	2003
2	John F Wakerly	Digital Design Principles and Practice	Pearson Education, New Delhi.	2002
3	Rafiquzzaman , M.	Fundamentals of Digital Logic and Microcomputer Design	Wiley–Interscience, New York	2005
4	John M Yarbrough	Digital Logic, Application and Design	Thomson, USA.	2002

WEBSITES

1. http://www.onesmartclick.com/engineering/linear–integrated–circuits.html
2. http://www.allaboutcircuits.com/vol_4/index.html

15BEEE405 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.
.
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

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

REFERENCES

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

WEBSITES

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

15BEEE411 ELECTRICAL MACHINES-II LABORATORY 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. V and Inverted V curves of Synchronous Motor
6. Equivalent Circuit of three phase Induction Motor
7. Load Test on three phase Induction Motor
8. Performance characteristics of three phase Induction Motor by Circle Diagram
9. Load Test on single phase Induction Motor
10. Speed control of Slip Ring Induction Motor
11. Study of different types of starting of Induction Motors

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. Finding solution of Transcendental equation
   i) Newton – Raphson Method
   ii) Bisection method
   iii) Iterative method by reducing the equation to the form x= f(x)

2. Finding the dominant eigenvalue and eigenvector by power method
3. Numerical integration
   i) Gauss 2 point and 3 point formulae
   ii) Trapezoidal method
   iii) Simpson's 1/3 rule
4. Solution of initial value problems governed by ODE
   i) Runge - Kutta 4th order method
   ii) Modified Euler's method
   iii) Milne's method
   iv) Adam – Bashforth method
5. Solution of BVP governed by PDE

   i) Laplace Equation
   ii) One – dimensional heat equation
      a) Explicit method : Bender – Schmidt's method
      b) Implicit method : Crank - Nicolson's method
   iii) One dimensional wave equation
      Implicit method

REFERENCES

S. 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

15BEEE413 CONTROL SYSTEM ENGINEERING LAB 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
- To find 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.

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.

15BEEE501 POWER ELECTRONICS L T P C 3 1 0 4

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 12

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 12

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 12

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 12

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 12

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: 60 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	2004
2	Ned Mohan, Tore M Undeland, William P Robbins	Power Electronics: Converters, Applications and Design	John Wiley and sons, New Delhi	2003
3	Singh. M.D and Kanchandani	Power Electronics	Tata McGraw Hill &Hill Publication Company limited, NewDelhi	2002

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Bimal K Bose	Modern Power 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

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

15BEEE502 POWER SYSTEM ANALYSIS L T P C 3 1 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

15BEEE503 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.

UNIT II CHARACTERISTICS OF OPAMP 9

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

UNIT III APPLICATIONS OF OPAMP 9

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

UNIT IV SPECIAL ICs 9

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

UNIT V APPLICATION ICs 9

IC voltage regulators – Fixed voltage regulators, Adjustable voltage regulators- 723 general purpose voltage regulator, LM380 power amplifier, ICL8038 function generator IC, isolation amplifiers, optocoupler, optoelectronic ICs.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Ramakant A Gayakward	Op-amps and Linear Integrated Circuits	Pearson Education, USA.	2011
2	Roy Choudhary, D, and Sheil B Jani	Linear Integrated Circuits	New Age Publishing, New Delhi.	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jacob Millman, Christos C Halkias	Integrated Electronics - Analog and Digital circuits system	Tata McGraw Hill, New Delhi.	2003
2	David A Bell	Op-amp and Linear ICs,	Prentice Hall of India, New Delhi.	2007

WEBSITE

http://www.onesmartclick.com/engineering/linear-integrated-circuits.html

15BEEE504 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

15BEEE504 MICROPROCESSOR AND MICROCONTROLLER L T P C 3 0 0 3

TEXT BOOKS

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

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Fernando E Valdes–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	2006
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

15BEEE511 POWER ELECTRONICS AND DRIVES 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

15BEEE512 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.

15BEEE513 MEASUREMENTS AND INSTRUMENTATION LABORATORY

L T P C 0 0 3 2

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.

SEMESTER VI

15BEEE601 SOLID STATE DRIVES L T P C 3 1 0 4

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.
- 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 12

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 12

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 12

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 12

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

UNIT V CONTTROLLER FOR DRIVES **12**

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

TOTAL: 60 HOURS

TEXT BOOK

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	2002

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

15BEEE602 POWER SYSTEM OPERATION AND CONTROL L T P C 3 1 0 4

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 12

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 12

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 12

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 12

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 12

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: 60 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,.	2003
2	Allen J Wood and Bruce F Wollenberg	Power Generation, Operation and Control	John Wiley and Sons, Inc..	2003

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 Delhi.3rd Edition,	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/CourseCourse Objectives.html

15BEEE603 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.

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

15BEEE604 ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT

L T P C 3 0 0 3

Course Objectives

- To know the fundamentals of cost analysis and economics.
- To learn about the basics of economics and cost analysis related to engineering so as to take economically sound decisions.
- To make the students to understand capital market, break even point analysis and depreciation
- To know economic evaluation and financial analysis of investments and projects.
- To know the financial management and stock exchanges.
- To know about the recent trends in it

Course Outcomes (COs)

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

1. Understand the principles and basic concepts.
2. Understnd the fundamentals of cost analysis and economics.
3. Understand the methodoloy of engineering economy and source of finance
4. Perform economic evaluation and financial analysis of investments and projects.
5. Analyse the financial management and stock exchanges.
6. Analyse the capital market, break even point analysis and depreciation for a project.

UNIT I FUNDAMENTALS OF ENGINEERING ECONOMICS 9

Introduction to Engineering Economics – Definition and Scope – Significance of Engineering Economics- Demand and supply analysis-Definition – Law of Demand – Elasticity of Demand– Demand Forecasting. Supply – Law of supply – Elasticity of Supply.

UNIT II FINANCIAL MANAGEMENT 9

Course Objectives and functions of financial management – financial statements, working capital management– factors influencing working capital requirements – estimation of working capital. Capital budgeting - Need for Capital Budgeting – Project Appraisal Methods - Payback Period
ARR – Time Value of Money.

UNIT III CAPITAL MARKET 9

Stock Exchanges – Functions – Listing of Companies – Role of SEBI – Capital Market Reforms. Money and banking - Money – Functions –Inflation and deflation – Commercial Bank and its functions – Central bank and its functions.

UNIT IV NEW ECONOMIC ENVIRONMENT 9

National Income – concepts – methods of calculating national income - Economic systems, economic Liberalization –Privatization – Globalization. An overview of International Trade – World Trade Organization – Intellectual Property Rights.

UNIT V COST ANALYSIS AND BREAK EVEN ANALYSIS 9

Cost analysis - Basic cost concepts – FC, VC, TC, MC – Cost output in the short and long run. Depreciation - meaning – Causes – Methods of computing Depreciation (simple problems in Straight Line Method, Written Down Vale Method). Meaning – Break Even Analysis - Managerial uses of BEA.

- **TOTAL: 45 HOURS**

TEXT BOOKS

S.No.	Author(s) Name	Title of the Book	Publisher	Year of publication
1	Ramachandra Aryasri .A, and V. V.Ramana Murthy	Engineering Economics & Financial Accounting	Tata McGraw Hill,–,New Delhi	2007
2	Varshney R. L., and K.L Maheshwari	Managerial Economics	Sultan Chand & Sons, New Delhi	2001

REFERENCES

S.No.	Author(s) Name	Title of the Book	Publisher	Year of publication
1	M.L.Jhingan	Principles of Economics	Konark Publications	2010
2	Prasanna Chandra	Fundamentals of Financial Management	Tata McGraw Hill, New Delhi.	2007
3	D.M.Mithani	Money, Banking, International Trade & Public Finance	Himalaya Publishing House	2004

WEBSITES

1. http://economictimes.indiatimes.com
2. http://www.economist.com/
3. http://www.managementstudyguide.com/financial-management.htm

15BEEE611 MICROPROCESSOR AND MICRO CONTROLLER LABORATORY

L T P C 0 0 3 2

COURSE 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 understand the real time application of it

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”.

15BEEE612 POWER SYSTEM SIMULATION LABORATORY L T P C 0 0 3 2

Course Objectives

Students will learn

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

Course Outcomes (COs)

1. Analyze the various line parameters
2. Evaluate the voltage regulation and efficiency of different types of transmission lines.
3. Analyze a network under symmetrical fault conditions and interpret the results
4. Analyze a network under unsymmetrical fault conditions and interpret the results
5. Evaluate the Bus impedance Matrix
6. Evaluate the Bus admittance Matrix

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.

SEMESTER VII

15BEEE701 **PROFESSIONAL ETHICS** **L T P C 3 0 0 3**

Course Objective

- To enable the students to create an awareness on Engineering Ethics and Human Values, 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

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

UNIT 1 INTRODUCTION TO ETHICS AND HUMAN VALUES 9

Meaning-Importance– Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT II 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 III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation –engineers as responsible experimenters – Characteristics of morally responsible engineers - codes of ethics –roles and limitations of codes - a balanced outlook on law –the proper role of law in engineering.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR)-discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw-Hill, New York	1996
2	Govindarajan M, Natarajan S, Senthil Kumar V. S	Engineering Ethics	Prentice Hall of India, New Delhi .	2004

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Charles D. Fleddermann	Engineering Ethics	Pearson Education / Prentice Hall, New Jersey	2004
2	Charles E Harris, Michael S. Protchard and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, United States	2000
3	John R Boatright	Ethics and the Conduct of Business	Pearson Education, New Delhi	2003
4	Edmund G Seebauer and Robert L Barry	Fundamentals of Ethics for Scientists and Engineers	Oxford University Press, Oxford	2001

15BEEE702 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.

UUNIT 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 – 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, SF_6 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/.

15BEEE703 DESIGN OF ELECTRICAL APPARATUS L T P C 3 1 0 4

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

UUNIT I MAGNETIC CIRCUITS AND COOLING OF ELECTRICAL MACHINES 12

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 12

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 12

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 12

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 12

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: 60 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sen, S.K	Principles of Electrical Machine Design with 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

15BEEE711 CONTROL AND MAINTENANCE LABORATORY L T P C 0 0 3 2

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.

15BEEE712 ELECTRICAL ESTIMATION AND REWINDING LABORATORY
L T P C 0 0 3 2

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

1. To do wiring and winding for all electrical equipment's.
2. To analysis the electrical estimation for residential flat
3. To analysis the electrical estimation for University building
4. To analysis the electrical estimation for Primary health centre
5. To analysis the electrical estimation for Party hall
6. 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.

15BEEE713 ELECTRIC DRIVES LABORATORY L T P C 0 0 3 2

Course Objectives

- To understand the gain knowledge about the various drives.
- To get the knowledge of speed control of stepper motor using microcontroller
- To get the knowledge of speed control of converter/chopper using microcontroller
- To get the knowledge of speed control of VSI fed 3 phase IM using microcontroller
- To learn speed control of different motors using DSP
- To understand the various process of electrical machines using simulation techniques

Course Outcomes

The students will be able to

- Analysis bout the various drives.
- Analysis speed control of stepper motor using microcontroller
- Analysis speed control of converter/chopper using microcontroller
- Analysis speed control of VSI fed 3 phase IM using microcontroller
- Analysis speed control of different motors using DSP
- Analysis various process of electrical machines using simulation techniques

LIST OF EXPERIMENTS

1. Micro controller based speed control of Converter/Chopper fed DC motor.

2. Micro controller based speed control of VSI fed three-phase induction motor.

3. Micro controller based speed control of Stepper motor.

4. DSP based speed control of BLDC motor.

5. DSP based speed control of SRM motor.

6. Self control operation of Synchronous motors.

7. Condition monitoring of three-phase induction motor under fault conditions.

8. Simulation of Four quadrant operation of three-phase induction motor.

9. Simulation of Automatic Voltage Regulation of three-phase Synchronous Generator.

10. Simulation of closed loop control of chopper fed Dc motor drive.

LIST OF DEPARTMENT ELECTIVES

ELECTIVE – I (ONLY APPLICABLE FOR FIFTH SEMESTER)

15BEEE5E01 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 1^{st} 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

15BEEE5E02 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

15BEEE5E03 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 Power plant instrumentation
- To acquire knowledge of renewable power system
- To study about technologies of distributed system
- To study layout and working of thermal, nuclear and hydropower plants.

Course Outcomes

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

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

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

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gupta, B. R.	Generation of Electrical Energy	S. Chand Publishing, New Delhi 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

15BEEE5E04 COMMUNICATION ENGINEERING L T P C 3 0 0 3

Course Objectives

- To introduce the fundamental techniques of analog, digital and data communication.
- To know satellite and fiber 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 development in it
- To study 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 transmission medium
6.understand the real time application of it

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

15BEEE5E05 INTRODUCTION TO NEURAL NETWORKS 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 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 algotihm – 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 induction motors

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

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

15BEEE6E01 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 trends in it

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

15BEEE6E02 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, Fuzzication- membership function-types, methods.

UNIT II FUZZY INFERENCE SYSTEM 9

Building Blocks of a Fuzzy system, fuzzication, fuzzy Rule-based Systems. Composition of rules, types of inference, defuzzication methods. Fuzzy control system- examples

UNIT III FUZZIFICZTION AND FUZZY ARITHMETIC 9

Lambda-cuts for fuzzy sets-lambda cutsfor fuzzy relations- defuzzification methodsExtension 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-multiCourse Objectives decision making – fuzzy bayesian decision method.

UNIT V APPLICATIONS 9

Single sample identification-multifeature pattern recognition-image processing-simple fuzzy logic controllers-General fuzzy logic controllers-Industrial applications-Fuzzy tool box in Matlab.

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

15BEEE6E03 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 BOOKS

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,	Power Electronics: Converters, Applications, and Design	Wiley	2002
	William P. Robbins			
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

15BEEE6E05 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

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

15BEEE6E05 **EMBEDDED SYSTEM** **L T P C 3 0 0 3**

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 & counting devices – Serial communication using I2C , 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 Nonmaskable interrupts, software interrupts, Preventing interrupts overrun - Disability interrupts. Multithreaded programming –Context Switching, Preemptive and non-preemptive multitasking, semaphores. Scheduling-thread states, pending threads, context switching.

UNIT IV REAL-TIME OPERATING SYSTEMS 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

15BEEE6E06 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 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 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

15BEEE6E07 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 frequency domain.
- 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**

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

15BEEE6E08 HIGH VOLTAGE ENGINEERING L T P C 3 0 0 3

CourseObjecti

- 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

15BEEE6E09 SPECIAL ELECTRICAL MACHINES L T P C 3 0 0 3

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

15BEEE6E10 FIBRE OPTICS AND LASER INSTRUMENTS L T P C 3 0 0 3

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 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 **Publications**	2002

ELECTIVE – IV AND ELECTIVE - V
(ONLY APPLICABLE FOR SEVENTH SEMESTER)

15BEEE7E01 **COMPUTER NETWORKS** **L T P C 3 0 0 3**

Course Objectives

- To study about various network architecture
- To study and analyse 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 Switches

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 Publication
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	Pearson Education	2007
		Networks		
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

15BEEE7E02 MOBILE COMMUNICATION L T P C 3 0 0 3

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

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

15BEEE7E03 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

TEXT BOOKS

15BEEE7E04 POWER SYSTEM TRANSIENTS L T P C 3 0 0 3

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 impact of voltage transients caused by faults, circuit breaker action,
- Load rejection on integrated power system.
- To study the recent advancement in it

Course Outcomes

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

- understand and observe the generation of switching transients and their control using circuit – theoretical concept.
- analyses mechanism of lighting strokes
- analyses the production of lighting surges
- design the propagation, reflection and refraction of travelling waves.
- design the circuit breaker for fault condition
- design various protective devices

UNIT I INTRODUCTION AND SURVEY 9

Source of transients, various types of power systems transients, effect of transients on power systems, importance of study of transients in planning.

UNIT II SWITCHING TRANSIENTS 9

Introduction, circuit closing transients: RL circuit with sine wave drive, double frequency transients, observations in RLC circuit and basic transforms of the RLC circuit. Resistance switching: Equivalent circuit for the resistance switching problems, equivalent circuit for interrupting the resistor current. Load switching: Equivalent circuit, waveforms for transient voltage across the load, switch; normal and abnormal switching transients. Current suppression, current chopping, effective equivalent circuit. Capacitance switching, effect of source regulation, capacitance switching with a restrike, with multiple restrikes, illustration for multiple restriking transients, ferroresonance.

UNIT III LIGHTNING TRANSIENTS 9

Causes of overvoltage, lightning phenomenon, charge formation in the clouds, rate of charging of thunder clouds, mechanisms of lightning strokes, characteristics of lightning strokes; factors contributing to good line design, protection afforded by ground wires, tower footing resistance. Interaction between lightning and power system: Mathematical model for lightning.

UNIT IV TRAVELLING WAVES ON TRANSMISSION LINE – COMPUTATION OF TRANSIENTS 9

Computation of transients: Transient response of systems with series and shunt lumped parameters and distributed lines. Travelling wave concept: step response, Bewely's lattice diagram, standing waves and natural frequencies, reflection and refraction of travelling waves.

UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM 9

The short line and kilometric fault, distribution of voltage in a power system: Line dropping and load rejection; voltage transients on closing and reclosing lines; over voltage induced by faults; switching surges on integrated system; EMTP for transient computation.

TEXT BOOKS

TOTAL: 45 HOURS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	R.D.Begamudre	Extra High Voltage AC Transmission Engineering	New Academic Science - 4 edition	2011

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	C.L.Wadhwa	Electrical Power Systems	New Age International Pvt., Ltd – 6^{th} edition	2010
2	Pritindra Chowdhari	Electromagnetic transients in Power Systems	Research Studies Press; 2 edition	2003

15BEEE7E05 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

15BEEE7E06 HVDC AND EHVAC LTPC 3 0 0 3

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

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

15BEEE7E07 SWITCHED MODE POWER CONVERSION L T P C 3 0 0 3

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 stste 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

15BEEE7E08 POWER SYSTEM RESTRUCTURE 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 OVERVIEW OF KEY ISSUES IN ELECTRIC UTILITIES RESTRUCTURING 9

Restructuring Models: PoolCo Model, Bilateral Contracts Model, Hybrid Model - Independent System Operator (ISO): The Role of ISO - Power Exchange(PX):Market Clearing Price(MCP) - Market operations: Day-ahead and Hour-AheadMarkets, Elastic and Inelastic Markets - Market Power - Stranded costs -Transmission Pricing: Contract Path Method, The MW-Mile Method - CongestionPricing: Congestion Pricing Methods, Transmission Rights - Management of Inter- Zonal/Intra Zonal Congestion: Solution procedure, Formulation of Inter-ZonalCongestion Sub problem, Formulation of Intra-Zonal Congestion Sub problem.

UNIT II ELECTRIC UTILITY MARKETS IN THE UNITED STATES 9

California Markets: ISO, Generation, Power Exchange, Scheduling Cocoordinator,UDCs, Retailers and Customers, Day-ahead and Hour-AheadMarkets, Block forwards Market, Transmission Congestion Contracts(TCCs) – New York Market: Market operations - PJM interconnection - Ercot ISO - New England ISO - Midwest ISO: MISO’s Functions, Transmission Management, Transmission System Security, Congestion Management, Ancillary Services Coordination, Maintenance Schedule Coordination - Summary of functions of U.S. ISOs.

UNIT III OASIS - OPEN ACCESS SAME-TIME INFORMATION SYSTEM 9

FERC order 889 - Structure of OASIS: Functionality and Architecture of OASIS - Implementation of OASIS Phases: Phase 1, Phase 1-A, Phase 2 - Posting of information: Types of information available on OASIS, Information requirement of OASIS, Users of OASIS - Transfer Capability on OASIS: Definitions, Transfer Capability Issues, ATC Calculation, TTC Calculation, TRM Calculation, CBM Calculation - Transmission Services - Methodologies to Calculate ATC -Experiences with OASIS in some Restructuring Models:

PJM OASIS, ERCOT OASIS.

UNIT IV ELECTRIC ENERGY TRADING 9

Essence of Electric Energy Trading - Energy Trading Framework: The Qualifying factors - Derivative Instruments of Energy Trading: Forward Contracts, Futures Contracts, Options, Swaps, Applications of Derivatives in Electric Energy Trading -Portfolio Management: Effect of Positions on Risk Management - Energy Trading Hubs - Brokers in Electricity Trading - Green Power Trading.

UNIT V ELECTRICITY PRICING - VOLATILITY, RISK AND FORECASTING 9

Electricity Price Volatility: Factors in Volatility, Measuring Volatility – Electricity Price Indexes: Case Study for Volatility of Prices in California, Basis Risk -Challenges to Electricity Pricing: Pricing Models, Reliable Forward Curves -Construction of Forward Price Curves: Time frame for Price Curves, Types of Forward Price Curves – Short-term Price Forecasting: Factors Impacting Electricity Price, Forecasting Methods, Analyzing Forecasting Errors, PracticalData Study.

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	Mohammad Shahidehpour and MuwaffaqAlmoush	Restructured ElectricalPower Systems Operation, Trading and Volatility	Marcel Dekkar, Inc	2001
2	M.Illic, F.Galiana and L.Fink	Power Systems Restructuring : Engineering and Economics	Kluwer Academic Publishers	2000
3	Editor, Loi Lei Lai	Power System Restructuring and Deregulation : Trading, Performance and Information Technology	John Wiley and sons Ltd	2001
4	K.Bhattacharaya, M.H.J.Bollen and J.E.Daader	Operation of Restructured Power Systems	Kluwer Academic Publishers	2001
5	F.C.Schweppe, M.C.Caramanis, R.D.Tabors and R.E.Bohn	Spot Pricing of Electricity	Kluwer Academic Publishers	2002
6	Editors: J.H.Chow F.F. Wu and J.A.Momoh	Applied Mathematics for Restructured Electric Power Systems: Optimization, Control and Computational Intelligence	Springer	2004

15BEEE7E09 PLC AND INDUSTRIAL AUTOMATION L T P C 3 0 0 3

Course Objectives

- To understand the basic principles of PLC and industrial automation 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 and spray process system
- To understand the principles of PID.

Course Outcome

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

UNIT I INTRODUCTION TO INDUSTRIAL AUTOMATION 9

Requirements of industrial automation- Industrial electrical equipment requiring control and integration through PLC –Functions of the central or distributed control panels in a plant- Conventional central relay and interlock panels and the various components used - Advantages of PLC based system.

UNIT II PLC CONFIGURATION FOR MEETING PLANT CONTROL FUNCTION 9

PLC configuration and various components of the PLC- CPU, I/O cards, power supply, memory, extension boards, communication boards- Overall Plant motor list from mechanical supplier - Deriving the required control elements, various sensors and functions- Area wise segregation of PLC depending on the locations of the inputs and outputs- Concept of parallel and serial (remote) inputs and outputs – Optimizing the overall cost of PLC and the control cabling.

UNIT III PLC HARDWARE 9

Detailed specifications of low, medium and high end PLC components like, CPU, Digital input and output modules, Analog input and output modules, special function modules parallel I/O-s and remote I/O-s – Special communication cables for the remote I/O-s - Segregation of the functions depending on the time critical or non- critical nature to decide parallel or remote I/Os- Deciding the memory size and capability based on program size and data – Cubicalization of the PLC and the I/O modules to optimize plant control cable cost – Assignment by using E-plan software or otherwise to detail the PLC and I/O-Switch their addressing –Location of PLC in the plant to optimize the cable cost –Cubicle layout.

UNIT IV PLC SOFTWARE 9

Getting started with PLC programming system- PC based programming software- Modes of PLC programming - Configuring PLC memory for program and data- Data types and addressing modes- Input and output configuration and addressing- PLC programming instructions- Basic instructions, medium end instructions and high end instructions- Testing and trouble shooting of the program software– Execution times and estimation overall PLC cycle time – Optimization of the cycle time - Use of hard-ware and software interrupts- Introduction to IEC 1131-3 for PLC programming- Assignment for writing PLC software and testing the same in laboratory.

UNIT V INTEGRATED AUTOMATION SYSTEM ELEMENTS 9

Introduction to integrated automation system and the various levels like level '0', level'1',level'2'- Introduction to field bus, control bus and information bus- Use of different protocols for interfacing with other automation system and drives- HMI-s and their functions for the various plant information- Integration of PLCs with plant HMI-s located at different strategic locations – Concept of client- server HMI-s and development and run type HMI-s - Assignment of screen development for a typical plant requirement.

TOTAL 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Frank D Petruzella	Programmable Logic Controllers	Tata McGraw Hill Publishers, III Edition	2005
2	Kevin Collins	PLC Programming for Industrial Automation	"", Meadow books	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	W.Bolton	Programmable Logic Controllers	Newnes Publication , IV Edition	2006
2	Gary Dunning	Introduction to Programmable Logic Controllers	Delmar Thomson Learning, II Edition	2001

15BEEE7E10 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

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

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

ELECTIVE – VI AND ELECTIVE – VII
(ONLY APPLICABLE FOR EIGTH SEMESTER)

15BEEE8E01 **ELECTRIC HYBRID VEHICLE** **L T P C 3 0 0 3**

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

15BEEE8E02 **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 SMARTGRID: 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 , Grzeg orz Pawel Benysek	Power Electronics in Smart Electrical Energy Networks	Springer, USA	2008

5	Hendrik C. Ferreira ,Lutz Lampe , John Newbury,Theo G Swart	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

15BEEE8E03 FLEXIBLE AC TRANSMISSION SYSTEMS L T P C 3 0 0 3

Course Objectives

- To study the various FACTS controllers and its applications.
- To study the characteristics of ac transmission
- To study the effect of shunt and series reactive compensation.
- To study the controllers of FACTS
- To study the coordination of FACT controlling systems
- To study about the reactive compensation according to the need

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

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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

Course Objectives 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

15BEEE8E04 POWER GENERATION ECONOMICS L T P C 3 0 0 3

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 sys tem 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 – Regions and structure of Indian Power System.

UNIT II ECONOMIC DISPATCH 9

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

UNIT III ECONOMIC OPERATION 9

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

UNIT IV INTERCONNECTED SYSTEMS 9

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

UNIT V OPTIMAL POWER FLOW AND FUNDAMENTALS OF MARKETS 9

Problem formulation - Cost minimization - Loss minimization - Solution using NLP and successive LP methods – Constraints - DC and AC OPF (Real and Reactive Power Dispatch)

Effect of Contingencies - Voltage and Phase angle - Transient Voltage Dip/Sag Criteria. Fundamentals of Markets – Introduction to Efficiency and Equilibrium - Modeling of consumers and producers – Single and Double Auction mechanism - Global welfare – Dead Loss – Spot and Forward Markets.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Allen J Wood and B F Wollenberg	Thyristor–Based Facts Controllers for Electrical Transmission Systems	John Wiley & Sons, New York	2004
2	D. P. Kothari and I. J. Nagrath	Modern Power System Analysis	Tata McGraw Hill Publishing Company, New Delhi	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Steven Stoft	Power System Economics	John Wiley & Sons	2000
2	Daniel S. Kirschen and GoranStrbac	Power System Economics	John Wiley & Sons	2004
3	HadiSaadat	Power System Analysis	Second Edition, McGraw Hill Publishers, Scholarly Transaction Papers	2002

15BEEE8E05 TOTAL QUALITY MANAGEMENT L T P C 3 0 0 3

CourseObjectives

- 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 STATISTICALPROCESS 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 HOURS

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

15BEEE8E06 INTELLECTUAL PROPERTY RIGHTS L T P C 3 0 0 3

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

15BEEE8E07 **POWER QUALITY** **L T P C 3 0 0 3**

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

15BEEE8E08 BIOMEDICAL INSTRUMENTATION L T P C 3 0 0 3

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

15BEEE8E09 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 conditioningSensors: 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

	Author (s) Name	Title of the Book	Publisher	Year of Publication
	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

15BEEE8E10 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
- Understand 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 IIFINITE 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 applications	Tata McGraw Hill Publishing Company limited, New Delhi	2001

15BEEE8E11 POWER SYSTEM DYNAMICS L T P C 3 0 0 3

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 modeling 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

15BEEE8E12 **VLSI DESIGN** **L T P C 3 0 0 3**

Course Objectives

- To introduce the technology and concepts of VLSI.
- To introduce MOS theory / Manufacturing Technology.
- To introduce FPGA architecture / principles / system design
- To study inverter / counter logic / stick / machine diagram
- To introduce sequential circuits / address / memory / arithmetic circuits
- To get familiarized with VHDL programming behavioral/Structural / concurrent / process.

Course Outcomes

At the end of the course the Outcomes will be able

- Fabrication of MOS Transistor
- Design of combinational circuits
- Program using VLSI for MOS Transistor
- Program using VLSI for NMOS and CMOS Inverter
- Program using VLSI for Subsystem design

UNIT I BASIC MOS TRANSISTOR **9**

Enhancement mode and Depletion mode – Fabrication (nMOS, pMOS, CMOS, BiCMOS) Technology – nMOS transistor current equation – second order effects – MOS Transistor Model.

UNIT II NMOS AND CMOS INVERTER **9**

nMOS and CMOS inverter – Determination of pull up / pull down ratios – stick diagram – λ based rules – super buffers – BiCMOS and steering logic.

UNIT III SUB SYSTEM DESIGN AND LAYOUT **9**

Structured design of combinational circuits – Dynamic CMOS and clocking – Tally circuits – (NAND–NAND, NOR–NOR and AOI logic) – EXOR structure – Multiplexer structures – Barrel shifter.

UNIT IV DESIGN OF COMBINATIONAL ELEMENTS AND REGULAR ARRAY LOGIC **9**

nMOS PLA – Programmable Logic Devices – Finite State Machine – PLA – Introduction to FPGA.

UNIT V VHDL PROGRAMMING **9**

RTL Design – combinational logic – Types – Operators – Packages – Sequential circuit – Sub programs – Test benches. (Examples: address, counters, flip–flops, FSM, Multiplexers / Demultiplexers).

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Pucknell, D. A., Eshraghian, K.	Basic VLSI Design	Prentice Hall of India, New Delhi	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Weste, N. H.	Principles of CMOS VLSI Design	Pearson Education, India - 4th edition	2010
2	Charles. H, jr. Roth	Fundamentals of Logic Design	Cengage Learning; 7 Har/Cdr edition	2013
3	Douglas Perry	VHDL Programming by Example	Tata McGraw Hill, New Delhi – 4th edition	2002
4	Bob Zeidmin	Introduction to Verilog	Swiss Creek Publications	2000

WEBSITES

1. esd.cs.ucr.edu
2. vhdlguru.blogspot.com/

15BEEE8E13 POWER GENERATION SYSTEMS L T P C 3 0 0 3

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 knowlege 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 POWERPLANT 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

15BEEE8E14 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

15BEEE8E15 OPTIMIZATION TECHNIQUES L T P C 3 0 0 3

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 Course Objectives OPTIMIZATION 9

Concept of pareto optimality-Conventional approaches for MOOP-Multi Course Objectives 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 Course Objectives 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 Course Objectives Problems	2 nd Edition, Springer	2007
2	Kwang Y.Lee,Mohammed A.El Sharkawi	Modern heuristic optimization techniques	John Wiley and Sons	2008

15BEEE8E16 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

15BEEE8E17 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 E.Goldberg	Genetic Algorithms:Search, Optimization and Machine Learning	Addison Wesley, N.Y	2004

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

15BEEE8E18 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

15BEEE8E19 VIRTUAL INSTRUMENTATION L T P C 3 0 0 3

Course Objectives

- To introduce concepts of Labview 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 instrumenattion

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	Lab-view Graphical Programming	Tata McGraw Hill Professional Publishing, IV	2006
	Jennings		Edition	
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

LIST OF OPEN ELECTIVE

LIST OF OPEN ELECTIVES OFFERED BY OTHER DEPARTMENTS DEPARTMENT OF SCIENCE AND HUMANITIES

15BESHOE01 INDUSTRIAL MATHEMATICS – I L T P C 3 0 0 3

Course Objectives

- To develop analytical skills for solving engineering problems
- To teach the students the basic concepts of LPP,
- To learn the techniques to solve transportation and Assignment problems
- To make the students to study about the Integer Programming and Network Analysis
- Analyse the results and propose recommendations to the decision-making processes in Management Engineering
- To learn the knowledge about application of it

Course Outcomes

- To define and formulate linear programming problems and appreciate their limitations.
- To solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained and translate solutions into directives for action.
- To be able to build and solve Transportation Models, Assignment Models,
- To construct linear integer programming models and discuss the solution techniques.
- To formulate and solve problems as networks and graphs.
- To be able to solve problems in different environments and develop critical thinking

UNIT I LINEAR PROGRAMMING PROBLEM 9

Formulation of LPP - Graphical Method - Simplex Method - Artificial variable technique and two phase simplex method. Duality - Dual and simplex method - Dual Simplex Method .

UNIT II TRANSPORTATION PROBLEM 9

Transportation Model, finding initial basic feasible solutions, moving towards optimality, Degeneracy.

UNIT III ASSIGNMENT PROBLEM 9

Solution of an Assignment problem, Multiple Solution, Hungarian Algorithm, Maximization in Assignment Model, Impossible Assignment.

UNIT IV INTEGER PROGRAMMING 9

Integer Programming Problem – Gromory’s fractional cut Method – Branch Bound Method

UNIT V NETWORK ANALYSIS 9

PERT & CPM- network diagram-probability of achieving completion date- crash time- cost analysis.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Hamdy Taha. A.	Operations Research	Prentice – Hall of India Private Limited, New Delhi	2013
2	Kanti Swarup, Manmohan, Gupta	Operations Research	Sultan Chand & Sons, New Delhi.	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Natarajan A.M., Balasubramani P., Thamilarasi A	Operations Research	Pearson Education, New Delhi.	2005
2	Srinivasan G	Operations Research: Principles and Applications	PHI Private Limited, New Delhi.	2007
3	Winston	Operations Research, Applications and Algorithms	Cengage Learning India Pvt. Ltd, New Delhi.	2004

WEBSITES

1. www.mathworld. Wolfram.com
2. www.mit.edu
3. www.nptel.com

15BESHOE02 INDUSTRIAL MATHEMATICS – II L T P C 3 0 0 3

Course Objectives

- To kindle analytical skills for solving engineering problems
- To impact the knowledge about inventory models
- To learn replacement models and simulation models
- To provide techniques for effective methods to solve nonlinear programming and decision making.
- To analyse the results and propose recommendations to the decision-making processes in Management Engineering
- To learn the knowledge about application of it

Course Outcomes

The students will

- To be able to solve simple models in Inventory problems and Replacement problems.
- To understand different queuing situations and find the optimal solutions using models for different situations.
- Simulate different real life probabilistic situations using Monte Carlo simulation technique.
- To be able to understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
- **Convert** and **solve** the practical situations into replacement mod
- To understand how to model and solve problems using non integer programming.

UNIT-1 INVENTORY MODELS 9

Economic order quantity models-techniques in inventory management-ABC analysis.

UNIT – II NON LINEAR PROGRAMMING 9

Khun-tucker conditions with non-negtive constraints- Quadratic programming- Wolf's modified simplex method.

UNIT – III SIMULATION MODELS 9

Elements of simulation model -Monte Carlo technique – applications. Queuing model: problems involving (M\M\1): (∞\FIFO) , (M\M\c): (∞\FIFO) Models.

UNIT –IV DECISION MODELS 9

Decision Analysis – Decision Making environment – Decisions under uncertainty – Decision under risk – Decision – Tree Analysis.

UNIT –V REPLACEMENT MODELS 9

Models based on models that gradually detoriate with time-whose maintenance cost increase with time-Replacement of items that fail suddenly and completely.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Hamdy Taha. A.	Operations Research	Prentice – Hall of India Private Limited, New Delhi .	2013
2	Kanti Swarup, Manmohan, Gupta	Operations Research	Sultan Chand & Sons, New Delhi.	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Natarajan A.M., Balasubramani P., Thamilarasi A	Operations Research	Pearson Education, New Delhi.	2005
2	Srinivasan G	Operations Research: Principles and Applications	PHI Private Limited, New Delhi.	2007
3	Winston	Operations Research, Applications and Algorithms	Cengage Learning India Pvt. Ltd, New Delhi.	2004

WEBSITES

1. www.mathworld. Wolfram.com
2. www.mit.edu
3. www.nptel.com

15BESHOE03 PROBABILITY AND RANDOM PROCESS L T P C 3 0 0 3

Course Objectives

- To gain knowledge in measures of central tendency.
- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of correlation and spectral densities.
- To learn the knowledge about application of it

Course Outcomes

- Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
- The students will have an exposure of various distribution functions, correlation and spectral densities.
- To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- To understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- To apply the concept random processes in engineering disciplines.
- To understand and apply the concept of correlation and spectral densities.

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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 Pubishers, 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.	Probabilitiy, 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

15BESHOE04 PROBABILITY AND STATISTICAL METHODS

L T P C 3 0 0 3

Course Objectives

- To gain knowledge in measures of central tendency and probability.
- To introduce the concept of random variable and functions of random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems
- To introduce the basic concepts of classifications of design of experiments
- To learn the knowledge about application of it

Course Outcomes

- The student gain the knowledge in measures of central tendency and probabil**ity**
- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of two dimensional random variables and apply in engineering applications.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments and statistical quality control.
- Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

UNIT I MEASURES OF CENTRAL TENDENCY AND PROBABILITY 12

Measures of central tendency – Mean, Median, Mode and Standard Deviation – SPSS Software Demonstration. Probability - Random variable - Axioms of probability - Conditional probability Total probability – Baye’s theorem - Probability mass function - Probability density function.

UNIT II STANDARD DISTRIBUTIONS 12

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma, and Normal distributions - Moment generating functions, Characteristic function and their properties.

UNIT III TWO DIMENSIONAL RANDOM VARIABLES 12

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

UNIT IV TESTING OF HYPOTHESIS 12

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

UNIT V DESIGN OF EXPERIMENTS 12

Analysis of variance – One way classification – CRD – Two way classification – RBD -

Latin square.

Note: Use of approved statistical tables permitted in the examination.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gupta, S.C. and Kapoor, V.K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2014
2	Athanasios	Probability Random	McGraw-Hill	2002
	Papoulis and S Unnikrishna Pillai	variables and Stochastic Processes	Publications, New Delhi.	

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Walpole, R.E., Myers, R.H., Myers, S.L and Ye, K	Probability and Statistics for Engineers and Scientists	Pearson Education Inc., Delhi.	2007
2	Lipschutz, S. and Schiller, J	Schaum's outlines - Introduction to Probability and Statistics	McGraw-Hill, New Delhi.	1998
3	Ross, S	A first Course in Probability	Pearson Education Inc., Delhi.	2014
4	Johnson, R.A, Irwin Miller	Miller & Freund's Probability and Statistics for Engineers	Pearson Education, Delhi	2014

WEBSITES

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld. Wolfram.com

15BESHOE05 PROBABILITY AND QUEUEING THEORY

L T P C 3 0 0 3

Course Objectives

- To understand the fundamental knowledge of probability theory.
- To introduce the concept of random variable and functions of random variables.
- To introduce the basic concepts of two dimensional random variables.
- To introduce the concepts of random processes and Markov chain
- To understand the different Queuing models and solve problems
- To learn the knowledge about application of it

Course Outcomes

- The student gain the knowledge in measures of central tendency and probability
- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of two dimensional random variables and apply in engineering applications.
- Understand the concepts of random process and markov chains
- They will be able to solve the Queuing models
- The students understand and characterize phenomena which evolve with respect to time in a probabilistic manner.

UNIT I PROBABILITY AND RANDOM VARIABLE **9**

Axioms of probability - Conditional probability - Total probability – Baye's theorem- Random variable - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

UNIT II STANDARD DISTRIBUTIONS **9**

Functions of a random variable - Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties.

UNIT III TWO DIMENSIONAL RANDOM VARIABLES **9**

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

UNIT I RANDOM PROCESS AND MARKOV CHAINS **9**

Classification - Stationary process - Markov process - Poisson process - Birth and death process - Markov chains - Transition probabilities - Limiting distributions.

UNIT QUEUEING THEORY **9**

Markovian models - M/M/1, M/M/C, finite and infinite capacity - M/M/∞ queues - Finite source model - M/G/1 queue (steady state solutions only) - Pollaczek - Khintchine formula - Special cases.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Ross,S	A first course in probability	Pearson Education, Delhi	2014
2	Medhi,J	Stochastic Process	New Age Publishers ,New Delhi	2014

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Veerarajan,T	Statistics and Random Processes	Tata McGraw-Hill, 2nd Edition, New Delhi.	2008
2	Allen,O	Probability, Statistics and Queuing Theory	Academic press, New Delhi.	1999
3	Gross, D., Shortle, J. F., Thompson J.M. and Harris, C.M	Fundamentals of Queuing theory	John Wiley and Sons Inc., New Jersey.	2008
4	Taha,H.A	Operations Research - An Introduction	Pearson Education Edition Asia, Delhi.	2006

WEBSITES

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.mit.edu

15BESHOE06 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 learn the knowledge about application of it

COURSE OUTCOME:

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

UNIT I FUZZY SETS 9

Fuzzy Sets : Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – F u z z y 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

WEBSITES

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

15BESHOE07 MATHEMATICAL PHYSICS L T P C 3 0 0 3

Course Objectives

- To know the fundamentals of Tensors.
- To know the series solutions to differential equations.
- To introduce the concepts of special functions.
- To study about Calculus of variations and integral equations
- To learn the knowledge about application of it

Course Outcomes

- Students will demonstrate proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics.
- Learn about special type of matrices that are relevant in physics and then learn about tensors.
- Get introduced to Special functions like Bessel, Legendre , Hermite and Laguerre functions and their recurrence relations
- Learn different ways of solving second order differential equations and familiarized with singular points and Frobenius method.
- Students will master in calculus of variations and linear integral equations.
- The students will have the knowledge on Mathematical Physics and that knowledge will be used by them in different engineering and technology applications.

UNIT I TENSORS 8

Definition of tensor - rank, symmetric tensors, contraction, quotient rule - tensors with zero components, tensor equations, metric tensors and their determinants - pseudo tens

UNIT II DIFFERENTIAL EQUATIONS-SERIES SOLUTIONS

Series Solution : Classification of singularities of an ordinary differential equation - Series solution-Method of Frobenius - indicial equation – example

UNIT III SPECIAL FUNCTIONS 8

Basic properties (Recurrence and Orthogonality relations, series expansion) of Bessel, Legendre , Hermite and Laguerre functions – Generating Function

UNIT IV CALCULUS OF VARIATIONS 9

Concept of variation and its properties – Euler's equation – Functional dependant on first and higher order derivatives – Functional dependant on functions of several independent variables – Variational problems with moving boundaries – Isoperimetric Problems – Direct methods – Ritz and Kantorovich methods.

UNIT V LINEAR INTEGRAL EQUATIONS 12

Introduction – conversion of a linear differential equation to an integral equations and vice versa

– conversion of boundary value problem to integral equations using Green's function – solution of a integral equation – integral equations of the convolution type – Abel's integral equations – integro–differential equations – integral equations with separable kernels – solution of Fredholm equations with separable kernels.

TOTAL: 45 HOURS

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	Murray R Spiegel, Seymour Lipschutz, Dennis Spellman	Vector Analysis	Tata Mc Graw Hill Education Pvt. Ltd., New Delhi	2010

WEBSITES

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.nptel.ac.in

15BESHOE08 ADVANCED ENGINEERING MATHEMATICS L T P C 3 0 0 3

Course Objectives

- To introduce the concepts of special functions.
- To find the solutions to partial differential equations and their applications
- To study about mathematical physics and perturbation techniques
- To learn replacement models and simulation models
- To provide techniques for effective methods to solve nonlinear programming and decision making
- To learn the knowledge about application of it

Course Outcomes

- Students know the concepts of improper integrals, Beta and Gamma functions.
- The students acquire sound knowledge of techniques in solving PDE that model engineering problems.
- Identify the situations where singular perturbations are needed. They will be able to use various modifications of matched asymptotic expansions techniques to derive asymptotic solutions.
- To be able to understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
- **Convert** and **solve** the practical situations into replacement models.
- To understand how to model and solve problems using non integer programming.

UNIT I INTRODUCTION TO SOME SPECIAL FUNCTIONS 9

Gamma function, Beta function, Bessel function, Error function and complementary Error function, Heaviside's function, pulse unit height and duration function, Sinusoidal Pulse function, Rectangle function, Gate function, Dirac's Delta function, Signum function, Saw tooth wave function, Triangular wave function, Half wave rectified sinusoidal function, Full rectified sine wave, Square wave function.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS 9

Formation PDEs, Solution of Partial Differential equations f(x,y,z,p,q) = 0, Nonlinear PDEs first order, Some standard forms of nonlinear PDE, Linear PDEs with constant coefficients, Equations reducible to Homogeneous linear form, Classification of second order linear PDEs. Separation of variables use of Fourier series, D'Alembert's solution of the wave equation, Heat equation: Solution by Fourier series and Fourier integral

UNIT III PERTURBATION TECHNIQUES 9

Singular perturbations (algebraic example). Notion of the boundary layer. Inner and outer solutions. Overlap region. Matching of the asymptotic expansions. Ordinary differential equations with singular perturbations. Methods to determine location of the boundary layer.

UNIT IV SIMULATION MODELS **9**

Elements of simulation model -Monte Carlo technique – applications. Queuing model: problems involving (M\M\1): (∞\FIFO) , (M\M\c): (∞\FIFO) Models.

UNIT V DECISION MODELS **9**

Decision Analysis – Decision Making environment – Decisions under uncertainty – Decision under risk – Decision – Tree Analysis.

TOTAL: 45 HOURS

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kreyszig,E	Advan ced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Gupta, A.S.	Calculus of Variations with Applications	Prentice Hall of India Pvt. Ltd., New Delhi	2008
3	Sankara Rao, K.	Introduction to Partial Differential Equations	Prentice Hall of India Pvt. Ltd., New Delhi	2010
4	Ali H Nayfeh	Perturbation Methods	John Wiley & Sons, New Delhi.	2008
5	Hamdy Taha. A.	Operations Research	Prentice – Hall of India Private Limited, New Delhi .	2010

WEBSITES

1. www.mathworld.wolfram.com
2. www.efunda.com
3. www.nptel.ac.in

L T P C 3 0 0 3

15BESHOE09 **LINEAR ALGEBRA**

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
- To learn the knowledge about application of it

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 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
- To analysis the real time application

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 - Eigenvalues 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**

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

15 BESHOE10 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

LTPC3003

Course Objectives

- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the basic concepts of PDE for solving standard partial differential equations
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

Course Outcomes:

- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- The learners can equip themselves in the transform techniques and solve partial differential equations
- Understand how to solve the given standard partial differential equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

UNIT I FOURIER SERIES 10

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 identify – Harmonic Analysis.

UNIT II FOURIER TRANSFORM 9

Fourier integral theorem (without proof) – Fourier transform pair –Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9

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

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9

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) – Fourier series solutions in Cartesian coordinates.

UNIT- V Z -TRANSFORM AND DIFFERENCE EQUATIONS 8

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

TOTAL: 45 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 Outcomess. 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

15BESHOE11 TECHNICAL WRITING L T P C 3 0 0 3

Course Objectives

- To Develop abilities to write technically and expressively,
- To Recognize writing as a constructive, meaningful process,
- To Practise using reading strategies for effective writing.
- To equip them to write for academic as well as work place context.
- To enable students to be familiar with structure and style of formal written communication
- To learn the knowledge about application of it

Course Outcomes

- Construct simple sentences, correct common grammatical errors in written English.
- Build confidence in English language by imbibing lexical and syntax rules.
- Enrich their reading ability for effective writing.
- Know the value of LSRW skills in document writing.
- Understand the structure, content and format of technical documents.
- Improve their writing skills and be ready with documents related ideas and notions.

UNIT I BASICS OF WRITING 7

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 2 PARAGRAPHS AND ESSAYS 9

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 3 MEMOS AND EMAIL 9

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 4 THE ART OF CONDENSATION AND TECHNICAL PROPOSALS 9

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 5 REPORTS AND RESEARCH ARTICLES 11

Discussion of newspaper articles -Course 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.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
	V.N. Arora & Lakshmi Chandra	Improve Your Writing: Revised First Edition	OUP, New Delhi.	2014

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	David Morley	The Cambridge Intro. to Creative Writing	CUP, New Delhi.	2010
2	Graham King	Collins Improve Your Writing	Collins; First edition, UK	2009
3	Crème, P. and M. Lea.	Writing at University: A guide for Outcomess.	OUP, New Delhi.	2003

WEBSITES

1. http://www.stevepavlina.com/blog/2006/08/10-ways-to-improve-your-technical-skills/ - Unit-I
2. http://www.nyu.edu/classes/keefer/brain/net2.html - Unit-I, II, & III
3. https://www.udemy.com/technical-writing-and-editing/ - Unit-IV & V
4. http://techwhirl.com/what-is-technical-writing/ - All Units

15BESHOE12 **GEOPHYSICS** **L T P C 3 0 0 3**

Course Objectives

- To inculcate the basics of brief history of Earth sciences
- To divulge knowledge on the basics of structure of earth and earth's gravitational field.
- To disseminate the fundamentals of magnetic field and thermal distribution of earth.
- To introduce the concepts of seismology and seismic waves .
- To impart the basic knowledge of oceans
- To learn the knowledge about application of it

Course Outcomes

- Gain knowledge on the basics of history of Earth sciences.
- Acquire knowledge on concepts of structure of earth and earth's gravitational field.
- Have adequate knowledge on the concepts of magnetic field and thermal distribution of earth
- Obtain knowledge on the basics of seismic waves.
- Understand the basics of oceans and properties of sea water.
- Apply the knowledge gained from this course to solve the relevant problems in engineering stream.

UNIT I ORIGIN OF EARTH **9**

A brief history of the development of Earth Sciences . An overview of Geophysical methods and their essential features, Problems of inversion and non-uniqueness in Geophysics, Origin & evolution of Solar system, Earth and Moon structure,. Kepler's law of planetary motion, A review of the Earth's structure and composition.

UNIT II STRUCTURE OF EARTH **9**

Chemical composition of Earth, Rheological behavior of crust and upper mantle, viscoelasticity and rock failure criteria, Geochronology: Radiometric dating and their advantages, meaning of radiometric ages, Major features of the Earth's gravitational field and relationship with tectonic processes in the crust and upper mantle, concept of isostasy, mathematical concept of Airy and Pratt hypotheses of isostasy.

UNIT III MAGNETIC FIELD AND THERMAL DISTRUBUTION OF EARTH **9**

Origin of geomagnetic field, polar wandering, secular variations and westward drift, reversals of geomagnetic field, sun spot, solar flares, geomagnetic storms, sea-floor spreading, Paleomagnetism and its uses, Thermal history of the Earth, sources of heat generation and temperature distribution inside the earth, convection in the mantle.

15BESHOE12 GEOPHYSICS L T P C 3 0 0 3

UNIT IV SEISMOLOGY 9

Earthquake seismology, Earthquakes and its classifications, Global seismicity and tectonics, Earth's internal structure derived from seismology, Earthquake mechanism and Anderson's theory of faulting, Continental drift and plate tectonics: its essential features, present day plate motions, Triple junctions, oceanic ridges, Benioff zones, arcs, hot spots, Mantle Plume, Mountain building, origin of Himalaya, Geodynamics of Indian subcontinent.

UNIT V OCEANS 9

Physical properties of seawater and methods of determination, distribution of salinity in the oceans, factors affecting salinity, water masses and water type, TS Diagram, Circulation of currents in major ocean waves. Tides: Dynamical and equilibrium theory of tides. Marine pollution, steps to control marine pollution, Laws of seas, Coastal zone management

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	B.F. Howell	Introduction to Geophysics	McGraw-Hill	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	W. Lowrie	Fundamentals of Geophysics	Cambridge University Press,	2007
2	J.A. Jacobs, R.D. Russel	Physics and Geology	McGraw-Hill	2002

WEBSITES

1. www. ocw.mit.edu
2. www.physicsclassroom.com
3. www.nptel.ac.in
4. www.physics.org

15BESHOE13 **ENGINEERING ACOUSTICS** **L T P C 3 0 0 3**

Course Objectives

- To disseminate the fundamentals of acoustic waves. (K)
- To inculcate the characteristics of radiation and reception of acoustic waves. (K)
- To divulge knowledge on the basics of pipe resonators and filters.(S)
- To introduce the features of architectural acoustics.**(S)**
- To impart the basic knowledge of transducers and receivers.(K)
- To learn the knowledge about application of it

Course Outcomes

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

UNIT I INTRODUCTION **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	4th edition 2000

REFERENCE

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	F. AltonEverest & Ken Pohlmann	Master Handbook of Acoustics	McGraw Hill Professional	6th edition 2014

WEBSITES

1. www. acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www. ocw.mit.edu

15BESHOE14 ALTERNATE FUELS AND ENERGY SYSTEMS L T P C 3 0 0 3

Course Objectives

- To understand about the fuel
- To study about the alcohols and its importance in engine
- To gain knowledge on the fuel gas and oils
- To get the information on fuel cell
- To understand electric, hybrid and solar cars
- To learn the knowledge about application of it

Course Outcomes

- Students will know about the basic concepts of alternate fuels
- Students will know about the basic concepts of alcohols.
- Students will understand about fuel gas and oils
- Students can enrich their knowledge about the alternate fuels and energy systems
- Develop their knowledge in studies of vegetable oils
- Students knows about the importance of electric, hybrid and solar cars

UNIT I INTRODUCTION 9

Need for alternate fuel, availability and properties of alternate fuels, general use of alcohols, LPG, hydrogen, ammonia, CNG and LNG, vegetable oils and biogas, merits and demerits of various alternate fuels, introduction to alternate energy sources and significance.

UNIT II ALCOHOLS 9

Properties as engine fuel, alcohols and gasoline blends, performance in SI engines, methanol and gasoline blends, combustion characteristics in CI engines, emission characteristics, DME, DEE properties performance analysis, performance in SI & CI Engines.

UNIT III NATURAL GAS, LPG, HYDROGEN AND BIOGAS 10

Availability of CNG, properties, modification required to use in engines, performance and emission characteristics of CNG & LPG in SI & CI engines, performance and emission of LPG. Hydrogen storage and handling, performance and safety aspects. Production of Biogas and its applications.

UNIT IV VEGETABLE OILSS 8

Various vegetable oils for engines, esterification, performance in engines, performance and emission characteristics, biodiesel and its characteristics.

UNIT V ELECTRIC, HYBRID, FUEL CELL AND SOLAR CARS 9

Layout of an electric vehicle, advantage and limitations, specifications, system components, electronic control system, high energy and power density batteries, hybrid vehicle, fuel cell vehicles, solar powered vehicles.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jain, P.C. and Monika Jain	Engineering Chemistry	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
2	Richard.L.Bechfold	Alternative Fuels	SAE International , USA	2002

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Saeid Mokhatab William A Poe	Hand book of Natural Gas Transmission and Processing, 2nd edition.	Gulf Professional Publisher, USA	2012
2	Nagpal G.R	Power Plant Engineering	Khanna Publishers, Delhi.	2002

WEBSITES

1.www.fao.org/docrep/t4470e/t4470e08.htm
2.http://www.exergy.se/goran/hig/ses/06/alternative%20fuels
3.http://www.alternative-energy-news.info/technology/transportation/hybrid-cars/

15BESHOE15 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 get the information on energy conservation.

Course Outcomes

- Property – Collection – Transfer Stations – Waste Minimization and Recycling of 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 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 Classficaition, 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, Remediaiton, 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

REFERENCES

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-	McGraw Hill Publishing Ltd., Newyork, 2nd edition	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_Waste.
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/

15BESHOE16 GREEN CHEMISTRY L T P C 3 0 0 3

Course Objectives

- To make the students conversant about the green chemistry
- To make the student acquire sound knowledge of the atom efficient process and synthesis elaborately.
- To acquaint the student with concepts of green technology.
- To develop an understanding of the basic concepts of renewable energy resources.
- To acquaint the students with the basic information on catalysis.
- To learn the knowledge about application of it

Course Outcomes

- Outline the basic principles of green chemistry (K)
- Examine the different atom efficient process and synthesis elaborately (S)
- Apply the concepts combustion of green technology (S)
- Identify and apply the concepts of renewable energy (S) Apply the concepts of green catalysts in the synthesis (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)
- Analysis the real time application of it

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	Anamaya publishers., New Delhi. 2nd edition	2007

REFERENCES

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

15BESHOE17 APPLIED ELECTROCHEMISTRY 3 0 0 3100

Course Objectives

- To make the students conversant with **the information on electrochemical material**.
- To make the student acquire sound knowledge of **conducting polymers**.
- To acquaint the student with concepts of Energy storage devices.
- To develop energy storage devices.
- To impart knowledge on basic principles of solar cells and its application.
- To learn the knowledge about application of it

Course Outcomes

- Outline the basic principles of chemistry in **electrochemical material (K)**
- Examine the properties of conducting polymers (S)
- Apply the concepts of electrochemistry in storage devices. (S)
- Identify the concepts of storage devices and its applications. (S)
- Apply the suitable materials for the manufacturing of storage devices. (S)
- 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

lectropolymerisation- 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-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

REFERENCES

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

15BESHOE18 INDUSTRIAL CHEMISTRY L T P C 3 0 0 3

Course Objectives

- To make the students conversant with **cement and lime** and its uses.
- To make the student acquire sound knowledge of abrasives and refractories.
- To acquaint the student with concepts of inorganic chemicals.
- To develop an understanding of the basic concepts **explosives**.
- To acquaint the students with the basics of **agriculture chemicals**.
- To learn the knowledge about application of it

Course Outcomes

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

UNIT I CEMENT AND LIME 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 – magnesian 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

REFERENCES

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

COMPUTER SCIENCE ENGINEERING

15BECSOE01 **PYTHON PROGRAMMING** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

- To learn how to use and manipulate several core data structures: Lists, Dictionaries, Tuples, and Strings
- To study decision structures and loops
- To understand the process and skills necessary to effectively deal with problem solving in relation to writing programs
- To understand the process and skills necessary to effectively deal with problem solving
- To discuss in relation to writing programs
- To study various program object and graphics based on python

COURSE OUTCOMES:

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

- Develop algorithmic solutions to simple computational problems Read, write, execute by hand simple Python programs
- Structure simple Python programs for solving problems
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python Programs
- Understand various program object and graphics based on python

UNIT I FUNDAMENTALS **9**

The Universal Machine-Program power- What is Computer Science?-Hardware Basics-Programming Languages-Python-Inside Python program-Software Development Process-Example program-Elements of programs- Output statements- Assignment Statements- Data types-Type conversions

UNIT II DECISION STRUCTURES AND LOOPS **9**

Simple Decisions-Two-way decisions-Multi-way decisions-Exception handling-for loops-indefinite loops-common loop patterns-Booleans

UNIT III FUNCTIONS **9**

Function of functions-Functions and Parameters-Function that returns values-Function that modifies parameters-Functions and program structures

UNIT IV SEQUENCES **9**

String data type- String Processing-List as sequences-String Representation-String Methods-I/O as String manipulation-File Processing

UNIT V OBJECTS AND GRAPHICS **9**

Overview-Object of Objects-Simple Graphics Programming-Using Graphical Objects-Choosing Coordinates- Interactive Graphics-Graphics module reference

TOTAL: 45 HOURS

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	John Zelle	Python Programming: An Introduction to Computer Science	2nd Edition, Franklin & Associates	2009
2	Mark Lutz	Learning Python	OReily	2013
3	David Beazly & Brian K. Jones	Python Cookbook	OReily	2013

15BECSOE02 INTERNET PROGRAMMING L T P C 3 0 0 3

COURSE OBJECTIVES:

- To study concepts of Internet, IP addresses and protocols
- To explain the concept of web page development through HTML
- To introduce the PERL and explore its current strengths and Weaknesses
- To write working Java code to demonstrate the use of applets for client-side programming
- To study Internet telephony and various multimedia applications
- To Elaborate on the principles of web page development

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Learn the advanced concepts& techniques of Internet and Java.
- Analyze the requirements for and create and implement the principles of web page development
- Understand the concepts of PERL
- Implement client-side programming using java applets
- Generate internet telephony based upon advanced concepts
- Develop applications on internet programming based on java applets and scripts

UNIT I INTRODUCTION 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

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	N.P. Gopalan and J. Akilandeswari	Web Technology: A Developer's Perspective	PHI Learning, Delhi	2013
2	Rahul Banerjee	Internetworking Technologies, An Engineering Perspective	PHI Learning, Delhi	2011

15BECSOE03 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

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ranjan Parekh	Principles of Multimedia	TMH	2007
2	Malay K. Pakhira	Computer Graphics, Multimedia and Animation	PHI Learning PVt Ltd	2010
3	Pankaj Dhaka	Encyclopedia of Multimedia and Animations	Anmol Publications	2011

15BECSOE04 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

REFERENCES

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
2	Peter Abel, Niyaz Nizamuddin	IMB PC Assembly Language and Programming	PHI Learning, Delhi	2011
3	Scott Mueller	Repairing PC's	PHI	1992

15BECSOE05 **GAME PROGRAMMING** **L T P C 3 0 0 3**

COURSE OBJECTIVES:

- To understand the basic requirements, installation and structure of gaming using Java
- Discuss various aspects of safe cracker projects
- Discuss various aspects of match game projects
- Discuss various aspects of pizza delivery projects
- Discuss various aspects of moon landing projects
- Discuss the process of development of gaming using Java

COURSE OUTCOMES:

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

- Interpret various concepts of gaming based on Java
- Design the frame and code to develop safe cracker project
- Design the frame and code to develop match game project
- Design the frame and code to develop pizza delivery project
- Design the frame and code to develop moon landing project
- Design and develop various games using Java

UNIT I INTRODUCTION 9

Introducing Games with Java- Requirements-Installing Netbeans IDE-Structure of Java Program-Structure of Java GUI-Swing controls-Stopwatch Project-Creating Frames-Adding Controls-Adding Event methods-Writing Code

UNIT II SAFECRACKER PROJECT 9

Frame design-Grid Bag Layout Manager-Code Design-Adding Sounds-Tic Tac Toe Project-Frame Design-Code Design-Adding Events-Adding Sounds

UNIT III MATCH GAME PROJECT 9

Preview-Frame Design-Photo Selection-Code Design-Timer Objects- Adding Delays-one player Solitaire game-Computer Moves

UNIT IV PIZZA DELIVERY PROJECT 9

Preview- Frame Design-Adding Clock-Game Design-Multiple Frames GUI- Leap Frog Project-Preview-Frame Design-Code Design- Introduction to OOP-Sprite Class-Collision detection between objects- Updating Scores

UNIT V MOON LANDING PROJECT 9

Preview-Frame Design- Code Design- Graphics Methods- Graphics 2D Objects-Stroke and Paint Objects-Shapes and Drawing Methods-Line, Rectangle and Ellipse-Scrolling Background-Sprite Animation

TOTAL: 45 HOURS

15BECSOE05 GAME PROGRAMMING L T P C 3 0 0 3

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Philip Conrod, Lou Tylee	Programming Games with Java		2013
2	Timothy M.Right	Fundamental 2D Game Programming with Java	Cengage Learning PTR	2013
3	Wayne Holder,Doug Bell	Java Game Programming for Dummies		

15BEECOE01 REAL TIME EMBEDDED SYSTEMS L T P C 3 0 0 3

Course Objectives

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management
- To imparts knowledge on

Course Outcomes

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

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

UNIT I INTRODUCTION TO EMBEDDED SYSTEM 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 - 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 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 wait 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 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.

- **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

15BEECOE02 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

15BEECOE03 FUNDAMENTALS OF NANOTECH L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the digital world
- To provide knowledge of computation and dynamical systems using neural networks

Course Outcomes

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

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts
- Ability to develop the use of Soft Computing to solve real-world problems

UNIT I LIMITATIONS OF CMOS 9

Fundamentals of MOSFET devices - Scaling of CMOS – Limitations – Alternative concepts in materials – **Structures of MOS devices:** SOI MOSFET, FINFETS, Dual Gate MOSFET, Ferro electric FETs.

UNIT II MICRO AND NANO FABRICATION 9

Optical Lithography – Electron beam Lithography – Atomic Lithography – Molecular beam epitaxy - Nano lithography.

UNIT III CHARACTERIZATION EQUIPMENTS 9

Principles of Electron Microscopes – Scanning Electron Microscope – Transmission Electron Microscope - Atomic Force Microscope – Scanning Tunneling Microscope.

UNIT IV NANO DEVICES – I 9

Resonant tunneling diodes – Single electron devices – Josephson junction – Single Flux Quantum logic – Molecular electronics.

UNIT V NANO DEVICES – II 9

Quantum computing: principles – Qbits – Carbon nanotubes (CNT): Characteristics, CNTFET, Application of CNT - Spintronics: Principle, Spin valves, Magnetic Tunnel Junctions, SpinFETs, MRAM

TOTAL: 45 HOURS

TEXT BOOK

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Rainer Waser (Ed)	Nano electronics and information technology	Wiley- VCH. 3rd Edition	2012

REFERENCES

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Thomas Heinzel	A Microscopic Electronics in Solid State Nanostructure	Wiley- VCH	2008
2	Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse	Nanotechnology – (Basic Science and Emerging Technologies	Overseas Press	2002
3	Mark Ratner, Daniel Ratner	Nanotechnology: A Gentle introduction to the Next Big idea	Pearson education	2003

15BEECOE04 **IMAGE AND VIDEO PROCESSING** **L T P C 3 0 0 3**

Course Objectives

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study the image compression procedures.
- To study the image segmentation and representation techniques.
- To study the video processing fundamentals
- To know the concepts of motion estimation

Course outcomes

- Understand the image fundamentals and mathematical transforms necessary for image processing.
- Understand the image enhancement techniques
- Understand the image compression procedures.
- Understand the image segmentation and representation techniques.
- Understand the video processing fundamentals
- Understand motion estimation concepts

UNIT I FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANSFORMS 9

Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels Image Transforms: 2 – D Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet transforms.

UNIT II IMAGE PROCESSING TECHNIQUES 9

Image Enhancement: Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters,Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering.

UNIT III IMAGE SEGMENTATION AND COMPRESSION 9

Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation Image Compression Image compression fundamentals – coding Redundancy, spatial and temporal redundancy. Compression models : Lossy and Lossless, Huffmann coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding, predictive coding , wavelet coding, JPEG standards.

UNIT IV BASICS OF VIDEO PROCESSING 9

Analog video, Digital Video, Time varying Image Formation models : 3D motion models, Geometric Image formation , Photometric Image formation, sampling of video signals, filtering operations.

UNIT V 2-D MOTION ESTIMATION 9

Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.

TOTAL: 45 HOURS

TEXTBOOKS

1. Gonzaleze and Woods ,"Digital Image Processing ", 3rd edition Pearson.
2. Yao wang, Joem Ostarmann and Ya – quin Zhang, "Video processing and communication ",1st edition PHI.

REFERENCES

1. M. Tekalp ,"Digital video Processing", Prentice ll International.
2. Aner ozdemi R, "Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms", JohnWiley & Sons.
3. Chris Solomon, Toby Breckon ,"Fundamentals of Digital Image Processing A Practical Approach with Examples in Matlab", John Wiley & Sons.

15BEECOE05 VLSI TECHNOLOGY L T P C 3 0 0 3

Course Objectives

- To learn the processing steps in fabrication of VLSI devices.
- To learn the concepts of assembling and packaging for VLSI devices.
- To imparts a good knowledge in reactive plasma etching techniques and equipment.
- To familiarize the students with the NMOS and CMOS IC technology.
- To make the student acquire reactive Plasma Etching techniques and Equipment.
- To acquaint the student with the VLSI assembly technology and package fabrication technology

Course outcomes

After completing this course, the students will be able to

- List out various fabrication techniques
- Understand the etching principle in IC fabrication
- Gain knowledge on deposition and diffusion methods
- Understand the process simulation and integration.
- Assembling and packing techniques
- various technologies used for fabricating VLSI devices

UNIT 1 9

Introduction to MOS Technologies: MOS, CMOS, BiCMOS Technology, Trends and Projections. Basic Electrical Properties of MOS, CMOS & BiCMOS Circuits: Ids-Vds relationships, Threshold Voltage Vt, Gm, Gds and ωo, Pass Transistor, MOS, CMOS & Bi CMOS Inverters, Zpu/Zpd, MOS Transistor circuit model, Latch-up in CMOS circuits.

UNIT II 9

Layout Design And Tools: Transistor structures, Wires and Vias, Scalable Design rules, Layout Design tools.
Logic Gates & Layouts: Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistive and Inductive interconnect delays.

UNIT III 9

Combinational Logic Networks: Layouts, Simulation, Network delay, Interconnect design, Power optimization, Switch logic networks, Gate and Network testing.

UNIT IV 9

Sequential Systems: Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.

UNIT V 9

Floor Planning & Architecture Design: Floor planning methods, off-chip connections, High-level synthesis, Architecture for low power, SOCs and Embedded CPUs, Architecture testing.

TOTAL: 45 HOURS

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	K. Eshraghian Eshraghian. D, A.Pucknell	Essentials of VLSI Circuits and Systems	PHI	2005
2	Wayne Wolf	Modern VLSI Design	Pearson Education, 3rd edition	1997

REFERENCES

1. Principals of CMOS VLSI Design – N.H.E Weste, K.Eshraghian, 2nd ed., Adisson Wesley.

15BEECOE06 FUNDAMENTALS OF MEMS L T P C 3 0 0 3

Course Objectives

- To study materials used for MEMS and its working
- To study the fabrication process used for MEMS
- To study the packaging process used for MEMS
- To familiarize the students with various micro actuators and micro sensors.
- To learn the survey of materials central to micro engineering.
- To imparts good knowledge in micro system packaging materials

Course Outcomes

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

- Appreciate the underlying working principles of MEMS devices.
- Understand the working of Micro sensors and actuators
- Explain the IC fabrication processes
- Gain knowledge on bulk manufacturing
- Understand the Design of Micro systems.
- Design and model MEMS devices.

UNIT I INTRODUCTION TO MEMS AND MICRO FABRICATION 9

History of MEMS Development, Characteristics of MEMS-Miniaturization - Micro electronics integration - Mass fabrication with precision. Sensors and Actuators- Energy domain. Sensors, actuators Micro fabrication - microelectronics fabrication process- Silicon based MEMS processes- New material and fabrication processing- Points of consideration for processing. Anisotropic wet etching, Isotropic wet etching, Dry etching of silicon, Deep reactive ion etching (DRIE), and Surface micromachining process- structural and sacrificial material.

UNIT II ELECTRICAL AND MECHANICAL CONCEPTS OF MEMS 9

Conductivity of semiconductors, crystal plane and orientation, stress and strain - definition - Relationship between tensile stress and strain- mechanical properties of Silicon and thin films, Flexural beam bending analysis under single loading condition- Types of beam- longitudinal strain under pure bending -deflection of beam- Spring constant, torsional deflection, intrinsic stress, resonance and quality factor.

UNIT III ELECTROSTATIC AND THERMAL PRINCIPLE SENSING AND ACTUATION 9

Electrostatic sensing and actuation-Parallel plate capacitor - Application- Inertial, pressure and tactile sensor parallel plate actuator- comb drive Thermal sensing and Actuations-Thermal sensors-Actuators- Applications Inertial, flow and infrared sensors.

UNIT IV PIEZORESISTIVE, PIEZOELECTRIC AND MAGNETIC PRINCIPLE SENSORS AND ACTUATOR 9

Piezoresistive sensors- piezoresistive sensor material- stress in flexural cantilever and membrane- Application-Inertial, pressure, flow and tactile sensor.Piezoelectric sensing and actuation-piezoelectric material properties-quartz- PZT-PVDF -ZnO- Application-Inertial, Acoustic, tactile, flow-surface elastic waves Magnetic actuation- Micro magnetic actuation principle- Deposition of magnetic materials-Design and fabrication of magnetic coil.

UNIT V POLYMER AND OPTICAL MEMS **9**

Polymers in MEMS- polymide-SU-8 Liquid crystal polymer(LCP)- PDMS – PMMA – Parylene - Flurocorbon, Application-Acceleration, pressure, flow and tactile sensors. Optical MEMS-passive MEMS optical components-lenses-mirrors-Actuation for active optical MEMS.

TOTAL: 45 HOURS

TEXT BOOK

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Chang Liu	Foundations of MEMS	Pearson Indian Print, 1st Edition	2012

REFERENCES

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Gaberiel M. Rebiz	RF MEMS Theory, Design and Technology	John Wiley & Sons	2003
2	Charles P. Poole and Frank J. Owens	Introduction to Nanotechnology	John Wiley & Sons	2003
3	Julian W.Gardner and Vijay K Varadhan	Microsensors, MEMS and Smart Devices	John Wiley & sons	2001

15BEECOE07 NEURAL NETWORKS AND ITS APPLICATIONS L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the digital world
- To provide knowledge of computation and dynamical systems using neural networks

Course Outcomes

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

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts
- Ability to develop the use of Soft Computing to solve real-world problems

UNIT I INTRODUCTION TO NEURAL NETWORKS 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 PERCEPTION 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

REFERENCES

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	2000
5	Robert J Schalkoff	Artificial Neural Networks	McGraw Hill	1997

15BEECOE08 FUZZY LOGIC AND ITS APPLICATIONS L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.
- Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- To learn about applications on Fuzzy based systems
- To familiarize with fuzzy fiction and de fuzzy fiction procedures

Course Outcomes

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

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

UNIT I **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**

Fuzzy Knowledge Based Controllers (Fkbc)**:** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures – Design of Fuzzy 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 **9**

FUZZY BASED SYSTEMS

Simple applications of FKBC -washing machines- traffic regulations -lift control-fuzzy 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 Fuzzy Control	Narosa Publishers India	1996
2	G. J. Klir and T. A. Folger	Fuzzy Sets Uncertainty and Information	PHI IEEE	1995

BIO TECHNOLOGY

15BTBTOE01 **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 equipment.
- To extend the knowledge in principle of heat transfer inside a bioreactor
- To construct the equipment's used in mass transfer operations.
- To learn the equipment's 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 equipment's for Bioprocess Engineering.
- Ability to construct the equipment's used in mass transfer operations.
- To acquire the knowledge of regulatory constraints in bioprocess
- Categorize the equipment's 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 SEPERATION EQUIPMENTS 9

Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotart drum drier and Swenson –walker crystallizer.

TEXT BOOKS

S. No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	James Edwin Bailey, David F. Ollis	Biochemical Engineering	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

15BTBTOE02 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

Properties of 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.

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	2000
3	Mircea Enachescu Dauthy	Fruit and Vegetable Processing	FAO agricultural services	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

15BTBTOE03 MOLECULAR MODELLING L T P C 3 0 0 3

COURSE OBJECTIVES

1. To understand the theoretical foundation of computational chemistry, with an emphasis on electronic structure calculations using quantum chemistry and classical molecular dynamics simulation techniques
2. To use computational chemistry software to simulate chemical processes, quantify and rationalise reactivity.
3. To study reaction mechanisms, relative free energies and structural dynamics
4. To compute different experimental properties and spectra using computational techniques.
5. To understand how to construct, interpret and utilise potential energy surfaces.
6. To understand the theoretical and practical challenges associated with computational modeling.

COURSE OUTCOMES

1. Understand the theoretical foundation of computational chemistry, with an emphasis on electronic structure calculations using quantum chemistry and classical molecular dynamics simulation techniques
2. Can use computational chemistry software to simulate chemical processes, quantify and rationalise reactivity.
3. Study reaction mechanisms, relative free energies and structural dynamics
4. Compute different experimental properties and spectra using computational techniques.
5. Understand how to construct, interpret and utilise potential energy surfaces.
6. Understand the theoretical and practical challenges associated with computational modeling.

UNIT I MOLECULAR MODELLING 9

Introduction to concept of molecular modeling, molecular structure and internal energy, applications of molecular graphics, coordinate systems, potential energy surfaces, discussion of local and global energy minima.

UNIT II QUANTUM MECHANICS 9

Introduction to the computational quantum mechanics; one electron atom, ply electronic atoms and molecules, Hartree Fock equations; calculating molecular properties using ab initio and semi empirical methods.

UNIT III MOLECULAR MECHANICS 9

Molecular mechanics; general features of molecular mechanics force field, bond stretching, angle bending, torsional terms, non – bonded interactions; force field parameterization and transferability; energy minimization; derivative and non – derivative methods, applications of energy minimization.

UNIT IV MOLECULAR DYNAMCS 9

Molecular dynamics simulation methods; molecular dynamics using simple models, molecular dynamics with continuous potential, setting up and running a molecular dynamic simulation, constraint dynamics; Monte Carlo simulation; Monte Carlo simulation of molecules.

UNIT V MODELLING AND DRUG DESIGN 9

Macromolecular modeling, design of ligands for known macro molecular target sites, Drug-receptor interaction, classical SAR /QSAR studies and their implications to the 3 D modeler, 2-D and 3-D database searching, pharmacophore identification and novel drug design, molecular docking, Structure-based drug design for all classes of targets.

TOTAL: 45 HOURS

TEXT BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Andrew Leach	Molecular Modelling: Principles and Applications	Prentice Hall	2001
2	N. Claude Cohen	Guidebook on Molecular Modeling in Drug Design	Academic Press	1996

REFERENCE BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Yvonne C. Martin, editor, Peter Willett	Designing bioactive molecules : three- dimensional techniques and applications	Washington, DC : American Chemical Society	1998
2	Matthew F. Schlecht	Molecular Modeling on the PC	Wiley- Blackwell; Har	1998

15BTBTOE04 BIOREMEDIATION L T P C 3 0 0 3

COURSE OBJECTIVES

1. To understand the basics of biology
2. To gain knowledge about different biomolecules
3. To get familiarize with human diseases.
4. To learn about DNA & RNA.
5. To learn about different clinical investigations
6. To know the recent advances in biology

COURSE OUTCOMES

At the end of the course

1. Summarize the cell structures and its functions
2. Explain the Biomolecules functions
3. Classify the communicable and non-communicable human diseases
4. Illustrate the different organ function tests
5. Tell the applications of biology in environmental applications
6. Describe the concept of biomechanics

UNIT I OVERVIEW OF BIOREMEDIATION 9

Pollution : Types and its consequences, History of bioremediation, Sources of contamination, Bioremediation processes, Environments where bioremediation is used, Microbiology of bioremediation.

UNIT II BIOFILM PROCESSES 9

Trickling Filters and Biological Towers, Rotating Biological Contactors, Granular Media Filters,Fluidized-bed Reactors, Hybrid Biofilm Processes.

UNIT III BIOREMEDIATION FOR SOIL ENVIRONMENT 9

Environment of Soil Microorganisms, Soil Organic Matter and Characteristics, Soil Microorganisms Association with Plants, Pesticides and Microorganisms, Petroleum Hydrocarbons and Microorganisms, Industrial solvents and Microorganism, Biotechnologies for Ex-Situ Remediation & in-Situ Remediation of Soil Phytoremediation Technology for Soil Decontamination.

UNIT IV BIOREMEDIATION FOR AIR AND WATER ENVIRONMEN 9

Atmospheric Environment for Microorganisms, Microbial Degradation of Contaminants in Gas Phase, Biological Filtration Processes for Decontamination of Air Stream-Biofiltration, Biotrickling Filtration, Bioscrubbers, Contaminants in Groundwater, Landfill Leachate Biotreatment Technologies, Industrial Wastewater Biotreatment Technologies, Biotreatment of Surface Waters.

UNIT V BIOREMEDIATION OF METALS 9

Microbial Transformation of Metals**,** Biological Treatment Technologies for Metals Remediation**,** Bioleaching and Biobenificiation**,** Bioaccumulation**,** Oxidation/Reduction Processes**,** Biological Methylation

TEXT BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Rittmann, B.E., and McCarty, P.L.,	Environmental Biotechnology : Principles and Applications.	McGraw Hill,	2001
2	John Cookson	Bioremediation Engineering: Design and Applications	McGraw-Hill	1995

REFERENCES

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Prescott, L. M., Harley, and Klein, D. A	Microbiology	McGraw-Hill Higher Education	2008

15BTBTOE05 BIOPHYSICS L T P C 3 0 0 3

COURSE OBJECTIVES

1. To study selected biological phenomena using physical principles.
2. To understand the biological and environmental sciences.
3. To gain the knowledge on technical enormous impact of the biological sciences.
4. To acquire the knowledge about molecular structure of biological systems.
5. To know the uses of proteins and its functions.
6. To understand the biological structure & function: Size and shape of macromolecules.

COURSE OUTCOMES

1. Study selected biological phenomena using physical principles.
2. Understand the biological and environmental sciences.
3. Gain the knowledge on technical enormous impact of the biological sciences.
4. Acquire the knowledge about molecular structure of biological systems.
5. Know the uses of proteins and its functions.
6. Understand the biological structure & function: Size and shape of macromolecules.

UNIT I MOLECULAR STRUCTURE OF BIOLOGICAL SYSTEMS 9

Intramolecular bonds – covalent – ionic and hydrogen bonds – biological structures -general features – water structure – hydration – interficial phenomena and membranes – self assembly and molecular structure of membranes.

UNIT II CONFORMATION OF NUCLEIC ACIDS 9

Primary structure – the bases – sugars and the phosphodiester bonds- double helical structure – A, B and Z forms – properties of circular DNA – topology – polymorphism and flexibility of DNA – structure of ribonucleic acids – hydration of nucleic acids.

UNIT III CONFORMATION OF PROTEINS 9

Conformation of the peptide bond – secondary structures – ramachandran plots – use of potential functions – tertiary structure – folding – hydration of proteins – hydropathy index.

UNIT IV ENERGETICS & DYNAMICS OF BIOLOGICAL SYSTEMS 9

Kinetics of ligand interactions; Biochemical kinetics studies, uni-molecular reactions, simple bi molecular multiple intermediates, steady state kinetics, catalytic efficiency, relaxation spectrometry, ribonuclease as an example.

UNIT V APPLIED TECHNIQUES 9

Techniques for the study of biological structure & function: Size and shape of macromolecules – methods of direct visualization macromolecules as hydrodynamic particles – macromolecules diffusion – ultra centrifugation – viscometry x-ray crystallography determination of molecular structures, X-ray fibre diffusion electron microscopy neutron scattering – light scattering.

TOTAL: 45 HOURS

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Roland Glaser	Biophysics	Springer Science & Business Media	2001
2	Michel Daune	Molecular Biophysics: Structures in Motion	Oxford University Press	1999
3	Charles R. Cantor	Biophysical Chemistry, Part 2: Techniques for tl Study of Biologic Structure and Function	W. H. Freeman and Company	1980

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15BTBTOE06 BASIC BIOINFORMATICS L T P C 3 0 0 3

COURSE OBJECTIVES

1. To understand the available tools and databases for performing research in bioinformatics.
2. To expose students to sequence alignment tool in bioinformatics.
3. To construct the phylogenetic trees for evolution.
4. To get familiar with the 3D structure of protein and classification.
5. To acquire basic knowledge in protein secondary structure prediction.
6. To extend the brief knowledge in Micro array data analysis.

COURSE OUTCOMES

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

1. Summarize the basic concepts and importance of Bioinformatics in various sectors.
2. Demonstrate the sequence alignment tool in bioinformatics.
3. Construct the phylogenetic trees for evolution.
4. Analyze the three dimensional protein structure and classification using various tools.
5. Illustrate the protein secondary structure prediction by comparative modeling.
6. 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; pharmainformatics 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, Michae 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

REFERENCES

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

15BTBTOE07 FUNDAMENTALS OF NANO BIOTECHNOLOGY L T P C 3 0 0 3

COURSE OBJECTIVES

1. To impart the skills in the field of nano biotechnology and its applications.
2. To acquire knowledge in the nano particles and its significance in various fields.
3. To extend the knowledge in types and application of nano particles in sensors.
4. To define the concepts of biomaterials through molecular self assembly.
5. To equip students with clinical applications of nano devices.
6. To describe deeper understanding of the socio-economic issues in nanobiotechnology.

COURSE OUTCOMES

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

1. Develop skills in the field of nano biotechnology and its applications.
2. Summarize the nanoparticles and its significance in various fields.
3. Extend the knowledge in types and application of nano particles in sensors.
4. Define the concepts of biomaterials through molecular self assembly.
5. Outline the clinical applications of nano devices.
6. 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.

TOTAL: 45 HOURS

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

REFERENCES

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

MECHANICAL ENGINEERING

15BEMEOE01 **INTRODUCTION TO MEMS** **L T P C 3 0 0 3**

Course Objective

1. To explain to the students about MEMS Technology, Present, Future and Challenges.
2. To gain a knowledge of basic approaches for microsystem design.
3. To gain a knowledge of state-of-the-art lithography techniques for microsystems.
4. To learn new materials, science and technology for microsystem applications.
5. To understand materials science for microsystem applications.
6. To understand state-of-the-art micromachining and packaging technologies.

Course Outcome

1. Students will explain MEMS Technology, Present, Future and Challenges.
2. Grain a knowledge of basic approaches for microsystem design
3. Gain a knowledge of state-of-the-art lithography techniques for microsystems
4. Learn new materials, science and technology for microsystem applications
5. Understand materials science for microsystem applications
6. Understand state-of-the-art micromachining and packaging technologies

UNIT I INTRODUCTION 9

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication - Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending- Torsional deflection.

UNIT II SENSORS AND ACTUATORS-I 9

Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Micro Grippers – Micro Motors - Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Thermal Bimorph - Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators- Actuation using Shape Memory Alloys

UNIT III SENSORS AND ACTUATORS-II 9

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT IV MICROMACHINING 9

Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies - Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS – Foundry process.

UNIT V POLYMER AND OPTICAL MEMS 9

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Chang Liu	Foundations of MEMS	Pearson Education Inc	2006
2	Stephen D Senturia	Microsystem Design	Springer Publication	2000
3	Tai Ran Hsu	MEMS & Micro systems Design and Manufacture	Tata McGraw Hill, New Delhi	2002

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nadim Maluf	An Introduction to Micro Electro Mechanical System Design	Artech House	2000
2	Mohamed Gad-el-Hak	The MEMS Handbook	CRC press Baco Raton	2000
3	Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim	Micro Sensors MEMS andSmart Devices	John Wiley & Son LTD	2002
4	James J.Allen	Micro Electro Mechanical System Design	CRC Press Publisher	2010
5	Thomas M.Adams and Richard A.Layton	Introduction MEMS, Fabrication and Application	Springer	2012

15BEMEOE02 **ROBOTICS** **L T P C 3 0 0 3**

Course Objective

1. To develop the student's knowledge in various robot structures and their workspace.
2. To develop student's skills in performing spatial transformations associated with rigid body motions.
3. To develop student's skills in perform kinematics analysis of robot systems.
4. To provide the student with knowledge of the singularity issues associated with the operation of robotic systems.
5. To provide the student with some knowledge and analysis skills associated with trajectory planning.
6. To provide the student with some knowledge and skills associated with robot control.

Course Outcome

1. Develop the student's knowledge in various robot structures and their workspace.
2. Develop student's skills in performing spatial transformations associated with rigid body motions.
3. Develop student's skills in perform kinematics analysis of robot systems.
4. Provide the student with knowledge of the singularity issues associated with the operation of robotic systems.
5. Provide the student with some knowledge and analysis skills associated with trajectory planning.
6. Provide the student with some knowledge and skills associated with robot control.

UNIT I FUNDAMENTALS OF ROBOT 9

Robot – Definition, Need for Robots, Robot Anatomy, Co-ordinate systems, Work Envelope, types and classification – specifications – Pitch, yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and their functions, grippers types. Forward kinematics, inverse kinematics-Manipulators with two, three degrees of freedom in 2D - Derivations and problems.

UNIT II DRIVES AND SENSORS 9

Drives- hydraulic, pneumatic and electrical. Force sensing, touch and tactile sensors, proximity sensors, non contact sensors and Machine vision sensors. Safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism.

UNIT III PROGRAMMING AND APPLICATIONS 9

Robot programming languages – VAL programming – Motion Commands, Sensorscommands. Role of robots in inspection, assembly, material handling, underwater, space, nuclear, defence and medical fields.

UNIT IV MACHINE VISION 9

Machine Vision - Sensing - Low and higher level vision - Image acquisition and digitization - Cameras, CCD,CID, CPD, etc., - Illumination and types - Image processing and analysis - Feature extraction - Applications.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS 9

RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Klafter R.D., Chmielewski T.A and Negin M	Robotic Engineering - An Integrated Approach	Prentice Hall	2003
2	Groover M.P	Industrial Robotics - Technology Programming and Applications	McGraw Hill	2001

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Craig J.J	Introduction to Robotics Mechanics and Control	Pearson Education	2008
2	Deb S.R	Robotics Technology and Flexible Automation	Tata McGraw Hill Book Co	1994
3	Koren Y	Robotics for Engineers	Mc Graw Hill Book Co	1992
4	Fu.K.S.,Gonzalz R.C. and Lee C.S.G	Robotics Control, Sensing, Vision and Intelligence	Mc Graw Hill Book Co	1987
5	Janakiraman P.A	Robotics and Image Processing	Tata McGraw Hill	1995
6	Rajput R.K	Robotics and Industrial Automation	S.Chand and Company	2008
7	Surender Kumar	Industrial Robots and Computer Integrated Manufacturing	Oxford and IBH Publishing Co. Pvt. Ltd	1991

15BEMEOE03 INDUSTRIAL SAFETY AND ENVIRONMENT L T P C 3 0 0 3

Course Objective

1. To recognize and evaluate occupational safety and health hazards in the workplace.
2. To determine appropriate hazard controls following the hierarchy of controls.
3. To analyse the effects of workplace exposures, injuries and illnesses, fatalities.
4. To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
6. To prevent or mitigate harm or damage to people, property, or the environment.

Course Outcome

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

15BEMEOE04 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 Outcome

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

REFERENCES

1. Geankoplis, C. J. 2003. Transport Processes and Separation Processes Principles. 4th Edition. Prentice Hall.
2. https://laulima.hawaii.edu/portal

15BEMEOE05 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 Outcome

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

AUTOMOBILE ENGINEERING

15BEAEOE01 AUTOMOBILE ENGINEERING L T P C 3 0 0 3

Course Objectives:

- To impart knowledge on the constructional details and principle of operation of various automobile components.
- To learn the function and working of various components in transmission and drive lines.
- To study the concept and working of steering and suspension systems in an automobile.
- To give knowledge on the wheels, tyres and brakes of automobiles.
- To provide information on the current and future trends in automobiles.
- Identify and explain the types of steering system.

Course Outcomes:

Upon successful completion of the course, the students should be able to:

- Demonstrate the operating principles and constructional details of various automobile components.
- Explain the function and working of components in transmission and drive lines.
- Identify and explain the types of steering system.
- Identify and explain the types of suspension system.
- Classify and describe the types of wheels, tyres and brakes of automobiles.
- Discuss the current and future trends in the automobiles.

UNIT I ENGINE AND FUEL FEED SYSTEMS 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. Objective of the gearbox - Determination of gear ratios for vehicles. Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propellar 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

UNIT III 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).

UNIT -V 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

S. No.	Author(s) Name	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 Publishes	2011

REFERENCES

S. No.	Author(s) Name	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	SAE Inc	2001

15BEAEOE02 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

S. No.	Author(s) Name	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

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

15BEAEOE03 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 anddimensional 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

S. No.	Author(s) Name	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			

15BEAEOE04 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

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1.	Ljubo Vlacic, 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

S. No.	Author(s) Name	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

CIVIL ENGINEERING

15BECEOE01 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, 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, Neighborhoods, 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	Himalaya Publishing House, Bombay	2001

REFERENCES

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.

15BECEOE02 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

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.
3 National Building Code.

15BECEOE03 COASTAL ZONE MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:

1. To understand the coastal processes, coastal dynamics, impacts of structures like docks, harbours and quays leading to simple management perspectives along the coastal zone.
2. To describe the Coastal zone regulations, coastal processes and wave dynamics.
3. To forecast waves and tides and plan coastal structures including harbours.
4. To explain which scientific background values that are necessary for a successful planning,
5. To apply knowledge about ecosystem values and management in the planning process,
6. To plan and carry out a simplified consultation process for activities in the coastal zone

OUTCOMES:

1. Understand the coastal processes, coastal dynamics, impacts of structures like docks, harbours and quays leading to simple management perspectives along the coastal zone.
2. The Coastal zone regulations, coastal processes and wave dynamics.
3. Forecast waves and tides and plan coastal structures including harbours.
4. To explain which scientific background values that are necessary for a successful planning,
5. To apply knowledge about ecosystem values and management in the planning process,
6. To plan and carry out a simplified consultation process for activities in the coastal zone

UNIT I COASTAL ZONE 9

Coastal zone – Coastal zone regulations – Beach profile – Surf zone – Off shore – Coastal waters – Estuaries – Wet lands and Lagoons – Living resources – Non living resources.

UNIT II WAVE DYNAMICS 9

Wave classification – Airy's Linear Wave theory – Deep water waves – Shallow water waves – Wave pressure – Wave energy – Wave Decay – Reflection, Refraction and Diffraction of waves – Breaking of waves – Wave force on structures – Vertical – Sloping and stepped barriers – Force on piles.

UNIT III WAVE FORECASTING AND TIDES 9

Need for forecasting - SMB and PNJ methods of wave forecasting – Classification of tides – Darwin's equilibrium theory of tides – Effects on structures – seiches, Surges and Tsunamis.

UNIT IV COASTAL PROCESSES 9

Erosion and depositional shore features – Methods of protection – Littoral currents – Coastal aquifers – Sea water intrusion – Impact of sewage disposal in seas.

UNIT V HARBOURS 9

Types of classification of harbours – Requirements of a modern port – Selection of site – Types and selection of break waters – Need and mode of dredging – Selection of dredgers.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Richard Sylvester	Coastal Engineering, Volume I and II	Elseiner Scientific Publishing Co	2006
2	Quinn, A.D	Design & Construction of Ports and Marine Structures	McGraw-Hill Book Co	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Ed. A.T. Ippen	Coastline Hydrodynamics	McGraw-Hill Inc., New York	2002
2	Dwivedi, S.N., Natarajan, R and Ramachandran, S	Coastal Zone Management in Tamilnadu	Wiley – 2nd edition	2012

15BECEOE04 EXPERIMENTAL METHODS AND MODEL ANALYSIS L T P C 3 0 0 3

OBJECTIVE:

1. To Describe some of the factors affecting reproducibility and external validity.
2. To List the different types of formal experimental designs (e.g. completely randomised, randomised block, repeated measures, Latin square and factorial experimental designs).
3. To explain the concept of variability, its causes and methods of reducing it
4. To describe possible causes of bias and ways of alleviating it
5. To identify the experimental unit and recognise issues of non-independence (pseudo-replication).
6. To describe the six factors affecting significance, including the meaning of statistical power and "p-values".

OUTCOMES:

1. Describe some of the factors affecting reproducibility and external validity.
2. List the different types of formal experimental designs (e.g. completely randomised, randomised block, repeated measures, Latin square and factorial experimental designs).
3. Explain the concept of variability, its causes and methods of reducing it
4. Describe possible causes of bias and ways of alleviating it
5. Identify the experimental unit and recognise issues of non-independence (pseudo-replication).
6. Describe the six factors affecting significance, including the meaning of statistical power and "p-values".

UNIT I MEASUREMENTS 9

Basic Concept in Measurements, Measurement of displacement, strain pressure, force, torque etc, Type of strain gauges (Mechanical, Electrical resistance, Acoustical etc..).

UNIT II GAUGING 9

Strain gauge circuits – The potentiometer and Wheatstone bridge – use of lead wires switches etc. Use of electrical resistance strain gauges in transducer applications.

UNIT III RECORDING DEVICES 9

Indicating and recording devices - Static and dynamic data recording –Data (Digital and Analogue) acquisition and processing systems. Strain analysis methods – Rosette analysis. Static and dynamic testing techniques. Equipment for loading-Moire's techniques.

UNIT IV NON DESTRUCTIVE TESTING TECHNIQUES 9

Non destructive testing techniques. Photoelasticity – optics of photoelasticity – Polariscope – Isoclinics and Isochromatics - methods of stress separation.

UNIT V LAWS OF SIMILITUDE 9

Laws of similitude - model materials – model testing – testing large scale structures – holographic techniques

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Dally J W and Riley W.F	Experimental stress Analysis	McGraw-Hill, Inc. New York	2005
2	Srinath L S et al	Experimental Stress Analysis	Tata McGraw-Hill Publishing co., Ltd., New Delhi	2006

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rangan C S et al	Instrumentation – Devices and Systems	Tata McGraw-Hill Publishing Co., Ltd., New Delhi	2002
2	Sadhu Singh	Experimental Stress Analysis	Khanna Publishers, New Delhi	2006

15BECEOE05 MANAGEMENT OF IRRIGATION SYSTEMS L T P C 3 0 0 3

OBJECTIVES

1. To enable the students for a successful career as water management professionals.
2. To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.
3. To expose the students the need for an interdisciplinary approach in irrigation water management
4. To providing a platform to work in an interdisciplinary team.
5. To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.
6. To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

OUTCOME

At the end of this the students will be in a capacity to

1. Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.
2. Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management
3. Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.
4. Gain insight on local and global perceptions and approaches to participatory water resource management
5. Learn from successes and failures in the context of both rural and urban communities of water management.
6. Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.

UNIT I IRRIGATION SYSTEM REQUIREMENTS 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

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 2000
2. Maloney, C. and Raju, K.V., “Managing Irrigation Together”, Practice and Policy in India, Stage Publication, New Delhi, India, 2000

15BECEOE06 COMPUTER AIDED DESIGN OF STRUCTURE L T P C 3 0 0 3

OBJECTIVE

At the end of this course, the students should have learnt the fundamentals of CAD, computer graphics, fundamentals of finite elements analysis, design and optimization and expert systems.

UNIT I INTRODUCTION 9

Fundamentals of CAD - Hardware and software requirements -Design process - Applications and benefits.

UNIT II COMPUTER GRAPHICS 9

Graphic primitives - Transformations -Wire frame modeling and solid modeling -Graphic standards – Drafting packages

UNIT III STRUCTURAL ANALYSIS 9

Fundamentals of finite element analysis - Principles of structural analysis -Analysis packages and applications.

UNIT IV DESIGN AND OPTIMISATION 9

Principles of design of steel and RC Structures -Applications to simple design problems – Optimisation techniques - Algorithms - Linear Programming – Simplex method

UNIT V EXPERT SYSTEMS 9

Introduction to artificial intelligence - Knowledge based expert systems -Rules and decision tables – Inference mechanisms - Simple applications.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Groover M.P. and Zimmers E.W. Jr	CAD/CAM, Computer Aided Design and Manufacturing	Prentice Hall of India Ltd, New Delhi	2005
2	Krishnamoorthy C.S.Rajeev S	Computer Aided Design	Narosa Publishing House, New Delhi	2000

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Harrison H.B	Structural Analysis and Design	Part I and II Pergamon Press, Oxford	2002
2	Rao S.S	Optimisation Theory and Applications	Wiley Eastern Limited, New Delhi	2002
3	Richard Forsyth (Ed)	Expert System Principles and Case Studies	Chapman and Hall, London	2000

15BECEOE07 PAVEMENT ENGINEERING L T P C 3 0 0 3

OBJECTIVES:

1. To understand the importance of transportation and characteristics of road transport
2. To know about the history of highway development, surveys and classification of roads
3. To study about the geometric design of highways
4. To study about traffic characteristics and design of intersections
5. To know about the pavement materials and design
6. To design flexible and rigid pavements as per IRC.

COURSE OUTCOMES

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

1. Carry out surveys involved in planning and highway alignment.
2. Design cross section elements, sight distance, horizontal and vertical alignment.
3. Implement traffic studies, traffic regulations and control, and intersection design.
4. Determine the characteristics of pavement materials.
5. Design flexible and rigid pavements as per IRC.
6. Will gain the knowledge of horizontal and vertical curves.

UNIT I TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM 9

Introduction - Pavement as layered structure - Pavement types - rigid and flexible -Stress and deflections in pavements under repeated loading

UNIT II DESIGN OF FLEXIBLE PAVEMENTS 9

Flexible pavement design - Empirical - Semi empirical and theoretical Methods - Design procedure as per latest IRC guidelines – Design and specification of rural roads

UNIT III DESIGN OF RIGID PAVEMENTS 9

Cement concrete pavements - Modified Westergard approach - Design procedure as per latest IRC guidelines - Concrete roads and their scope in India.

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE 9

Pavement Evaluation [Condition and evaluation surveys (Surface Appearance, Cracks, Patches And Pot Holes, Undulations, Ravelling, Roughness, Skid Resistance), Structural Evaluation By Deflection Measurements, Present Serviceability Index] Pavement maintenance. [IRC Recommendations Only]

UNIT V STABILISATION OF PAVEMENTS 9

Stabilisation with special reference to highway pavements - Choice of stabilisers -Testing and field control – Stabilisation for rural roads in India -use of Geosynthetics (geotextiles & geogrids) in roads.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kadiyali, L.R	Principles and Practice of Highway Engineering	Khanna tech. Publications, New Delhi	2007

2	Croney, D	Design and Performance of Road Pavements	HMO Stationary Office	2005
3	Wright, P.H	Highway Engineers	John Wiley & Sons, Inc., New York	2001

REFERENCES

1. Yoder R.J and Witczak M.W., “Principles of Pavement Design”, John Wiley, 2003.
2. Guidelines for the Design of Flexible Pavements, IRC:37 - 2001, The Indian roads Congress, New Delhi.
3. Guideline for the Design of Rigid Pavements for Highways, IRC:58-2001, The Indian Roads Congress, New Delhi.
4. Design and Specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi, 2001.

15BECEOE08 ROCK ENGINEERING L T P C 3 0 0 3

OBJECTIVES:

1. To understand the role of geology in the design and construction process of underground openings in rock.
2. To apply geologic concepts and approaches on rock engineering projects
3. To identify and classify rock using basic geologic classification systems.
4. To use the geologic literature to establish the geotechnical framework needed to properly design and construct heavy civil works rock projects.
5. To sequential design process used in geotechnical engineering practice.
6. To Require civil engineering students to read and summarize geologic literature for site specific projects.

OUTCOMES:

1. Understand the role of geology in the design and construction process of underground openings in rock.
2. Geologic concepts and approaches on rock engineering projects
3. Identify and classify rock using basic geologic classification systems.
4. Use the geologic literature to establish the geotechnical framework needed to properly design and construct heavy civil works rock projects.
5. Sequential design process used in geotechnical engineering practice.
6. Require civil engineering students to read and summarize geologic literature for site specific projects.

UNIT I CLASSIFICATION AND INDEX PROPERTIES OF ROCKS 9

Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose.

UNIT II ROCK STRENGTH AND FAILURE CRITERIA 9

Modes of rock failure – Strength of rock – Laboratory and field measurement of shear, tensile and compressive strength – Stress strain behaviour in compression – Mohr-coulomb failure criteria and empirical criteria for failure – Deformability of rock.

UNIT III INITIAL STRESSES AND THEIR MEASUREMENTS 9

Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – technique for measurements of insitu stresses.

UNIT IV APPLICATION OF ROCK MECHANICS IN ENGINEERING 9

Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence.

UNIT V ROCK BOLTING 9

Introduction – Rock bolt systems – rock bolt installation techniques – Testing of rock bolts – Choice of rock bolt based on rock mass condition.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Goodman P.E	Introduction to Rock Mechanics	John Wiley and Sons	2005
2	Stillborg B	Professional User Handbook for rock Bolting	Tran Tech Publications	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Brow E.T	Rock Characterisation Testing and Monitoring	Pergaman Press	2002
2	Arogyaswamy R.N.P	Geotechnical Application in Civil Engineering	Oxford and IBH	2000
3	Hock E. and Bray J	Rock Slope Engineering	Institute of Mining and Metallurgy	1991

15BECEOE09 STORAGE STRUCTURES L T P C 3 0 0 3

OBJECTIVE:

1. To learnt the design of various steel water tanks, concrete water tanks, steel bunkers and silos, concrete bunkers and silos and pre stressed concrete water tanks
2. To design the storage structures.
3. To gain knowledge of steel water tanks and their design.
4. To get a brief idea about concrete water tanks.
5. To design steel bunkers and silos
6. To design pre stressed concrete water tanks

OUTCOMES:

1. The design of various steel water tanks, concrete water tanks, steel bunkers and silos, concrete bunkers and silos and pre stressed concrete water tanks
2. Design the storage structures.
3. Gain knowledge of steel water tanks and their design.
4. Get a brief idea about concrete water tanks.
5. Design steel bunkers and silos
6. Design pre stressed concrete water tanks

UNIT I STEEL WATER TANKS 9

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays –Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation

UNIT II CONCRETE WATER TANKS 9

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of under ground tanks – Design of base slab and side wall – Check for uplift.

UNIT III STEEL BUNKERS AND SILOS 9

Design of square bunker – Jansen's and Airy's theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – stiffeners.

UNIT IV CONCRETE BUNKERS AND SILOS 9

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction.

UNIT V PRESTRESSED CONCRETE WATER TANKS 9

Principles of circular prestressing – Design of prestressed concrete circular water tanks.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rajagopalan K	Storage Structures	Tata McGraw-Hill, New Delhi	2002

2	Krishna Raju N	Advanced Reinforced Concrete Design	CBS Publishers and Distributors, New Delhi	2000

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	R.G.Hopkinson and J.D.Kay	The Lighting of buildings	Faber and Faber, London	2000
2	William H.Severns and Julian R.Fellows	Air-conditioning and Refrigeration	John Wiley and Sons, London	2000

15BECEOE10 **WIND ENGINEERING** **L T P C 3 0 0 3**

OBJECTIVES:

1. To understand the need of energy conversion and the various methods of energy storage
2. To explain the field applications of solar energy
3. To identify Winds energy as alternate form of energy and to know how it can be tapped
4. To explain bio gas generation and its impact on environment
5. To understand the Geothermal &Tidal energy, its mechanism of production and its applications
6. To illustrate the concepts of Direct Energy Conversion systems & their applications.

OUTCOMES:

1. Understand the need of energy conversion and the various methods of energy storage
2. Explain the field applications of solar energy
3. Identify Winds energy as alternate form of energy and to know how it can be tapped
4. Explain bio gas generation and its impact on environment
5. Understand the Geothermal &Tidal energy, its mechanism of production and its applications
6. Illustrate the concepts of Direct Energy Conversion systems & their applications.

UNIT I INTRODUCTION 9

Terminology – Wind Data – Gust factor and its determination - Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift.

UNIT II EFFECT OF WIND ON STRUCTURES 9

Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only).

UNIT III EFFECT ON TYPICAL STRUCTURES 9

Tail buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges.

UNIT IV APPLICATION TO DESIGN 9

Design forces on multistorey building, towers and roof trusses.

UNIT V INTRODUCTION TO WIND TUNNEL 9

Types of models (Principles only) – Basic considerations – Examples of tests and their use.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Peter Sachs	Wind Forces in Engineering	Pergamon Press, New York	2002
2	Lawson T.V	Wind Effects on Buildings, Vols. I and II	Applied Science and Publishers, London	2005

REFERENCES

1. Devenport A.G., “Wind Loads on Structures”, Division of Building Research, Ottowa, 2003
2. Wind Force on Structures – Course Notes, Building Technology Centre, Anna University, 2002.

15BECEOE11 ADVANCED CONSTRUCTION TECHNOLOGY L T P C 3 0 0 3

OBJECTIVE:

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

OUTCOMES:

1. Implementation of new technology concepts which are applied in field of Advanced construction.
2. Different methods of construction to successfully achieve the structural design with recommended specifications.
3. Application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process
5. Development to the students for the courses in sector of Advanced construction technology.
6. The new technology of civil Engineering and concepts related Advanced construction technology.

UNIT I MODERN CONSTRUCTION METHODS 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

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Varma.M	Construction Equipment and its Planning & Applications	Metropoltian 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

15BEEEOE01 ELECTRIC HYBRID VEHICLE L T P C 3 0 0 3

Course Objectives

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

Course Outcomes:

- Summarize the basic concepts in bioprocess Engineering.
- Explain the concept of Hybrid Electric Vehicles.
- Understand the concept of Hybrid Electric Drive-Trains.
- Identify the different Energy Management Strategies.
- Understand the concept of different Energy Storage devices.
- Analyze the different motor drives used in Hybrid Electric Vehicles.

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

15BEEEOE02 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.

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.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS 9

Power factor - methods of improvement, location of capacitors, p.f with non linear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and 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	▪ Lulu Enterprises, Inc. - 8th Edition Volume II	2013

15BEEEOE03 SENSORS AND TRANSDUCERS 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 capacitive transducers
- It deals with inductive transducers
- It deals with some of the miscellaneous transducers
- It deals with characteristics of transducers

Course Outcomes (COs)

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	18th Edition,	2007

		Electronics Measurements and Instrumentation	Dhanpat Rai & Company Private Limited	
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	London : McGraw-Hill Higher Education 5th edition	2003
2	Patranabi. D	Sensors and Transducers	PHI Learning Pvt. Ltd – 2nd edition	2003
3	John. P, Bentley	Principles of Measurement Systems	4th Edition, Prentice Hall	2004
4	Murthy.D.V.S	Transducers and Instrumentation	PHI Learning Pvt. Ltd 2nd edition	2010

15BEEEOE04 PROGRAMMABLE LOGIC CONTROLLER L T P C 3 0 0 3

Course Objectives

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

Course Outcome

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

UNIT I INTRODUCTION 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

15BEEEOE05 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 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

15BEEEOE06 ADVANCED CONTROL SYSTEMS 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 linearizing 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 – 4th edition	2006
2	Ashish Tewari	Modern control Design with Matlab and Simulink	John Wiley, New Delhi	2002
3	Benjamin C. Kuo	Digital Control Systems	Oxford University Press – 2nd edition	2012

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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	Prentice Hall, 7th edition	2014
3	Raymond T. Stefani & Co	Design of feedback Control systems	Oxford University Press,	2002