FACULTY OF ENGINEERING

IASE University

Gandhi Vidya Mandir, Sardarshahr (Rajasthan) – 331403, INDIA

Teaching and Examination Scheme and Syllabus

for

BACHELOR OF ENGINEERING
(Electrical Engineering)
(Four-Year Full Time Degree Programme)
(SEMESTER SCHEME)

Rules And Guidelines For The Students

1. The Bachelor of ENGINEERING (Electrical Engineering) course is a four year (Eight Semester) full time integrated degree programme.

2. ELIGIBILITY for Admission

A candidate seeking admission to the first year of the Bachelor of Engineering (Electrical Engineering) course shall be required to have passed 10+2 examination in Science with Physics, Chemistry and Mathematics from any board recognized by Rajasthan Board of Secondary Education, Rajasthan with at least 45% marks in aggregate for general category candidates, and 40% for SC/ST/OBC candidates.

3. ADMISSION procedure

Admission to the first year B.E. course shall be made on the basis of marks scored by the candidates in his/her 10+2 examination.

4. THE PROGRAMME

The Bachelor of Engineering (Electrical Engineering) is a four year (Eight semesters) full time degree program .The course structure and program administration are as follows.

5. COURSE STRUCTURE

The four year, eight semester teaching consists of Theory (Lectures and Tutorials) and Practicals/Sessionals (Laboratory work, Engineering Graphics, Workshop Practice and Project etc.).Examination will be held at the end of the each semester. Details of these are given in the Teaching & Examination Scheme.

6. PROGRAMME ADMINISTRATION

6.1 Medium of Instruction

English shall be the medium of instruction and examination.

6.2 EVALUATION

(a) Each subject will be evaluated through a theory paper at the end of the semester carrying 100 marks along with continuous evaluation of sessional work, carrying 50 marks. The theory paper shall be of three hour duration. The sessional work will consist of continuous assessment of student's performance by teachers in tutorial classes, and class tests.

(b) Three class tests will be organized in each semester as per the scheme. The higher two out of the marks scored in the three tests will be considered for the sessional marks.

(c) Evaluation of laboratory practical work and Engineering Graphics (Drawing) will be through continuous assessment throughout the semester as well as examination at the end of the semester.

(d) At the end of the sixth semester the student will undergo practical training for a period of at least 45 working days in an industry / research organization related to his / her field of Study. At the end of the training, the student will submit its report to the

Head of the Department within three weeks of the start of the seventh semester. The work of the practical training will be evaluated by a board of two teachers appointed by the Head of the Department. The later will counter sign the marks awarded by the board.

(e) Project: The project work will be carried out in the VII & VIII semester. The topic of the project will be approved by the Head of the Department and the entire project work will be carried out under the guidance of a teacher of the department approved as project supervisor by the Head of the Department. The nature of the project work will consist of varying proportions of designing, fabrication, testing and analysis of results. The project topic can also be taken from a live industrial problem. The report of the completed project shall be signed by the guide and submitted to the Head of the Department on or before the last working day of the eighth semester. The evaluation of the project will be done by a board consisting of two examiners.

7. Promotion

7.1 The maximum span period of a program is eight years from the date of registration in the program.

7.2 The minimum marks for passing the examination for each semester shall be 50% in each practical/ sessional, 40% in End Semester Examination of each theory paper, 50% in training and project, and 45% in the aggregate of all the subjects (theory, sessional and project) of the semester.

7.3 A student will be permitted to attend the classes of the second/fourth/sixth/eighth semesters immediately after the examination of the first/third/fifth/seventh semester's examination, as the case may be, provided he/she has appeared in the first/third/fifth/seventh semester examination, respectively.

7.4 To be eligible for promotion to the 3rd semester of the program a student must have successfully cleared at least 10 subjects out of the 20 subjects including practicals of the first and second semesters taken together.

7.5 To be eligible for promotion to the 5th semester of the program a student must have successfully cleared at least 12 subjects out of the 23 subjects including practicals and sessionals of the third and fourth semesters taken together.

7.6 To be eligible for promotion to the 7th semester of the program a student must have successfully cleared at least half the subjects including practicals and sessionals of the fifth and sixth semesters taken together.

7.7 A student promoted to the third/fifth/seventh semesters, without having cleared all the papers, will have to appear and pass the backlog papers of the first/third/seventh semesters along with the regular examination of the first/third/fifth semesters and backlog papers of the second/fourth/sixth semesters along with the regular examination of the second/fourth/sixth semesters.

7.8 A candidate who has secured minimum marks to pass in each paper but has not secured the minimum marks required to pass in the aggregate for the semester concerned may take re-examination in not more than two papers to obtain the aggregate percentage required to pass the semester. The candidate will have to pay the requisite examination fee in order to be eligible for re- examination. In this case the marks secured by the candidate in the earlier examination in the paper concerned will be cancelled.

7.9 (a) Award of Division:

Securing 60% marks and above – Ist division

Securing 50% and above but below 60% - IInd division

Securing 45% and above but below 50% - pass

For first B.E. to 3rd B.E. the division will be decided based on the marks obtained in the respective class/ year.

(b) For the declaration of Final B.E. result, marks will be totalled up as follows:

First B.E.: 50% of the marks secured

Second B.E.: 75% of the marks secured

Third B.E.: 100% of the marks secured

Final B.E.: 100% of the marks secured

- A student who has secured 75% marks and above shall be declared to have passed in first division with honors. However, for this the student must have cleared successfully all the subjects in single attempt in the final year period of his/her study.
- Similarly, to be eligible for a gold medal on account of having secured first position, the student must have cleared all subjects in single attempt and passed them with first division.

7.10 For determining merit position of the candidates at the final year level the marks obtained by them in the second, third and final year as described above shall only be considered.

7.11 If a student (who has successfully completed the programme) wishes to reappear in one or more theory papers of the first, second, third, fourth, fifth, sixth, seventh or eighth semesters for the purpose of improving his/her marks, he/she will be permitted to do so on payment of requisite examination fee along with the regular examinations of that semester; however, the total number of such attempts shall not exceed four theory papers during the span period of the programme. For this his/her previous performance in the paper/papers concerned shall be treated as cancelled. The application for such reappearing/re-examination must be submitted before the next examination of the corresponding semester. However, such candidates shall not be considered for award of gold medal.

7.12 A student to be eligible for award of degree has to clear all papers offered during four-year programme within the span period of eight years.

8. LATERAL ENTRY

Students who have passed 3 year diploma examination from the Board of Technical Education, Rajasthan, or its equivalent with a minimum of 60% marks can be admitted to the Third Semester of the B. E. programme. However, they will be required to pass a course on Special Mathematics (BE300) for Diploma pass students. Students will have to pass this course before they are admitted to the seventh semester. However, the marks obtained in this course will not be counted for deciding the division of the student.

9. Attendance: All students are required to have 75% attendance in each subject and there must be 75% attendance of the student before he/she could be permitted to appear in the examination.

10. RULES FOR CHANGE OF BRANCH FOR THE STUDENTS OF III SEM. B.TECH/ B.E.:

I The faculty, on the basis of applications received from desirous students up to the date and time notified by the Director, will prepare a merit list of the students. The list will be prepared on the basis of overall merit of the I (Semester) result only and the applications for change of branch will be processed as per the merit list.

II Request for change from B.E. to B. Tech. programme or vice versa by any student will be considered only if, the candidate fulfills basic admission criteria for the desired programme and using the guidelines below:

If the candidate is eligible for change from B. Tech. to B.E. & vice-versa is found deficit in the course coverage of first and second semester, he will have to pass the deficit courses before the candidate is admitted to the seventh semester. However, the marks obtained in the deficit courses will not be added for deciding the division of the student.

ELIGIBILITY CRITERIA:

(a) The students must have passed the I Semester B.Tech./B.E Examination in all components in one attempt with at least 60% marks in aggregate. The student with back papers or whose result has not been declared will not be considered for change of branch.

(b) In case any student has applied for re-valuation/ re-totaling of his/her marks of I Semester B.Tech/B.E and the result has not been received till the time of change of branch, such a student will not be entitled for change of branch on the basis of his/her subsequently revised result.

PROCEDURE:

1) Applications in a specified format (developed by the faculty) for change of branch will be invited by the Director/Principal of the faculty on the basis of the result of I (Semester) B. Tech./ B.E in duplicate, upto the date notified by IASE University. One copy of each such application be sent to IASE University by that date.

2) The students would submit a photo copy of I (Semester) Examination mark sheet of that year along with the application. The student may give as many preferences as possible against the vacant seats in respective college.

3) A seat matrix shall be prepared by the faculty, as per the details of the vacant seats (admitted through direct admission) in the previous year.

4) Due to change of branch, the strength of student in any branch should not fall short of 75% of the enrolled students in that branch in that year. And under no circumstances, due to change of branch, the number of seats in a particular branch in a college shall exceed the sanctioned strength approved by the AICTE, for that batch.

5) All students who have applied for the change of branch in-time will be called for counseling by the admission council of the faculty and considered for change of branch as per merit, preference and availability of seat. However, at the time of the counseling, if any student wishes to withdraw his/her application he/she can do so by a written request. In case any student does not present himself/herself for counseling, his/her branch will be changed as per the preference mentioned in the application form, merit and availability of seat.

11. RULES FOR THE AWARD OF GRACE MARKS

A. UNDER GRADUATE/ POST GRADUATE (MAIN/SUPPLYMENTARY EXAMINATIONS UNDER THE FACULTIES OF ENGINEERING & TECHNOLOGY.

Grace marks to the extent of 1% of the aggregate marks prescribed for an examination will be awarded to a candidate failing in not more than 25% of the total number of theory papers, practicals, sessionals, dissertation, viva-voce and the aggregate, as the case may be in which minimum pass marks have been prescribed; provided the candidate passes the examination by the award of such Grace marks. For the purpose of determining the number of 25% of the papers, only such theory papers practicals, dissertation, viva-voce etc. would be considered, of which, the examination is conducted by the University.

N.B.:- If 1% of the aggregate marks or 25% of the papers works out in fraction, the same will be raised to the next whole number. For example, if the aggregate marks prescribed for the examination are 450, grace marks to the extent of 5 will be awarded to the candidate, similarly, if 25% of the total papers is 3.2, the same will be raised to 4 papers which grace marks can be given.

GENERAL:-

- A candidate passes in a paper/ practical or the aggregate by the award of grace marks will be deemed to have obtained the necessary minimum for a pass in that paper/ practical or in the aggregate and shown in the marks sheet to have passed by grace. Grace marks will not be added to the marks obtained by a candidate from the examiners nor will the marks obtained by the candidate be subject to any deduction due to award of grace marks in any other paper/ practical or aggregate.
- If a candidate passes the examination but misses First or Second Division by one mark, his aggregate will be raised by one mark so as to entitle him for the first or second division, as the case may be. This one mark will be added to the paper in which he gets the least marks and also in the aggregate by showing +1 in the tabulation register below the marks actually obtained by the candidate. The marks entered in the marks-sheet will be inclusive of one grace mark and it will not be shown separately.
- Non appearance of a candidate in any paper will make him ineligible for grace marks. The place of a passed candidate in the examination list will, however be determined by the aggregate marks he secures from the examiners, and he will not, by the award of grace marks, become entitled to a higher division.
- Distinction won in any subject at the examination is not to be forfeited on the score that a candidate has secured grace to pass the examination.

Note: - The Grace marks will be awarded only, if candidate appears in all the papers prescribed for the examination.

TEACHING & EXAMINATION SCHEME
for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – First Year **Semester - I**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	BE101	English	3	1	-	30	20	50	100	150
2	BE102	Engineering Mathematics-I	3	1	-	30	20	50	100	150
3	*BE103/203	Engg. Physics/Engg. Chemistry	3	1	-	30	20	50	100	150
4	BE104	Computer Systems & Programming	3	1	-	30	20	50	100	150
5	BE105	Electrical & Electronics Engg.	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
6	*BE106/208	Engg. Physics/ Engg. Chemistry Lab	-	-	3	50	-	50	50	100
7	BE107	Computer Programming Lab	-	-	3	50	-	50	50	100
8	BE108	Practical Geometry	-	-	3	50	-	50	50	100
9	BE109	Workshop Practice	-	-	3	50	-	50	50	100
10	BE110	Electrical & Electronics Lab	-	-	2	50	-	50	50	100
		Total Hours	15	5	14					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1250

*Half of the intake of the student of the faculty shall study Physics and rest of the students shall study Engineering Chemistry in First Semester. In Second Semester, the students shall interchange the subjects.

TEACHING & EXAMINATION SCHEME

for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – First Year **Semester - II**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	BE201	Communication Techniques	3	1	-	30	20	50	100	150
2	BE202	Engineering Mathematics –II	3	1	-	30	20	50	100	150
3	*BE203/103	Engg. Chemistry /Engg. Physics	3	1	-	30	20	50	100	150
4	BE204	Engineering Mechanics	3	1	-	30	20	50	100	150
5	BE205	Mechanical Engineering	3	1	-	30	20	50	100	150
6	BE206	Environmental Studies& Disaster Management	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	BE207	Language Lab	-	-	2	45	-	45	30	75
8	*BE208/106	Engg. Chemistry /Engg. Physics	-	-	3	50	-	50	50	100
9	BE209	Environmental Engg. Lab	-	-	2	45	-	45	30	75
10	BE210	Machine Drawing	-	-	3	50	-	50	50	100
11	BE211	Discipline & Extracurricular Activities	-	-	-	-	-	100	-	100
		Total Hours	18	6	10					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1350

*Half of the intake of the student of the faculty shall study Physics and rest of the students shall study Engineering Chemistry in First Semester. In Second Semester, the students shall interchange the subjects.

TEACHING & EXAMINATION SCHEME

For B.E. (Electrical Engineering) – Four Year (8 Semester) Full Time Degree Programme

B.E. (EE) – Second Year

Semester - III

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	EE 301	POWER ELECTRONICS – I	3	1	-	30	20	50	100	150
2	EE 302	COMPUTER PROGRAMMING-I	3	1	-	30	20	50	100	150
3	EE 303	CIRCUIT ANALYSIS-I	3	1	-	30	20	50	100	150
4	EE 304	ELECTRICAL MACHINES-I	3	1	-	30	20	50	100	150
5	EE 305	ELECTRICAL MEASUREMENTS	3	1	-	30	20	50	100	150
6	EE 306	MATHEMATICS-III	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	EE 307	POWER ELECTRONICS LAB-I	-	-	2	50	-	50	50	100
8	EE 308	COMPUTER PROGRAMMING LAB-I	-	-	2	45	-	45	30	75
9	EE 309	ELECTRICAL CIRCUIT LAB	-	-	2	45	-	45	30	75
10	EE 310	ELECTRICAL MACHINE LAB-I	-	-	2	50	-	50	50	100
11	EE 311	ELECTRICAL MEASUREMENT LAB	-	-	2	50	-	50	50	100

TA- Teacher's Assessment
CT- Class Test
ESE- End Semester Examination

Total Contact Hours-34
Total Marks-1350

	BE 300*	Special Mathematics	3	1	-	30	20	50	100	150

*This Course of Special Mathematics (BE300) is compulsory for student's having been admitted in B.E after passing Engineering Diploma. Students have to pass this course, however the marks obtained in this will not be counted for deciding the division of the student.

TEACHING & EXAMINATION SCHEME

For B.E. (Electrical Engineering)– Four Year (8 Semester) Full Time Degree Programme

B.E. (EE) – Second Year

Semester - IV

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	EE401	Power Electronics-II	3	1	-	30	20	50	100	150
2	EE402	Digital Electronics	3	1	-	30	20	50	100	150
3	EE403	Electrical Machines-II	3	1	-	30	20	50	100	150
4	EE404	Computer Programming-II	3	1	-	30	20	50	100	150
5	EE405	Circuit Analysis-II	3	1	-	30	20	50	100	150
6	EE406	Advance Mathematics	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	EE407	Power Electronics Lab.-II	-	-	2	50	-	50	50	100
8	EE408	Digital Electronics Lab.	-	-	2	50	-	50	50	100
9	EE409	Electrical Machine Lab-II	-	-	2	50	-	50	50	100
10	EE410	Computer Programming Lab-II	-	-	2	50	-	50	50	100
11	EE411	Humanities and Social Science	-	-	2	50	-	50	50	50
12	EE412	Discipline & Cocurricular Activities	-	-	-	-	-	100	-	100

TA- Teacher's Assessment
CT- Class Test
ESE- End Semester Examination

Total Contact Hours-34
Total Marks-1450

TEACHING & EXAMINATION SCHEME

for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – Third Year **Semester - V**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	EE501	Power Electronics-III	3	1	-	30	20	50	100	150
2	EE502	Microprocessors & Computer Architecture	3	1	-	30	20	50	100	150
3	EE503	Control Systems	3	1	-	30	20	50	100	150
4	EE504	Generation of Electrical Power	3	1	-	30	20	50	100	150
5	EE505	Transmission & Distribution of Electrical Power	3	1	-	30	20	50	100	150
6	EE506	Advanced Distribution System	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	EE507	Power Electronics Lab-III	-	-	2	50	-	50	50	100
8	EE508	Microprocessor Lab	-	-	2	50	-	50	50	100
9	EE509	MATLAB Programming Lab	-	-	2	45	-	45	30	75
10	EE510	Power System Design	-	-	2	50	-	50	50	100
11	EE511	Entrepreneurship Development	-	-	2	45	-	45	30	75
		Total Hours	18	6	10					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1350

TEACHING & EXAMINATION SCHEME

for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – Third Year **Semester - VI**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	EE601	Modern Control Theory	3	1	-	30	20	50	100	150
2	EE602	High Voltage Engineering	3	1	-	30	20	50	100	150
3	EE603	Protection of Power System	3	1	-	30	20	50	100	150
4	EE604	Advanced Power Electronics	3	1	-	30	20	50	100	150
5	EE605	Data Structures in C	3	1	-	30	20	50	100	150
6	EE606	Power System Instrumentation	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	EE607	Control System Lab	-	-	2	50	-	50	50	100
8	EE608	Power System Lab	-	-	2	50	-	50	50	100
9	EE609	Data Structures Lab	-	-	2	50	-	50	50	100
10	EE610	Advanced Power Electronics Lab	-	-	2	45	-	45	30	75
11	EE611	High Voltage Engineering Lab	-	-	2	45	-	45	30	75
12	EE612	Discipline & Cocurricular Activities	-	-	-	-	-	100	-	100
		Total Hours	18	6	10					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1450

TEACHING & EXAMINATION SCHEME

for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – Fourth Year **Semester - VII**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	EE701	Data Base Management System	3	1	-	30	20	50	100	150
2	EE702	Power System Analysis	3	1	-	30	20	50	100	150
3	EE703	Artificial Intelligence Techniques	3	1	-	30	20	50	100	150
4	EE704	Utilization of Electrical Power	3	1	-	30	20	50	100	150
5	EE705	Power System Engineering	3	1	-	30	20	50	100	150
6	EE706	Electromagnetic Field Theory	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	EE707	DBMS Lab	-	-	2	50	-	50	50	100
8	EE708	Power System Modelling & Simulation Lab	-	-	2	50	-	50	50	100
9	EE709	Industrial Economics & Management	-	-	2	50	-	50	50	100
10	EE710	Project Stage I	-	-	2	50	-	50	50	100
11	EE711	Practical Training & Industrial Visit	-	-	2	30	-	30	20	50
		Total Hours	18	6	10					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1350

TEACHING & EXAMINATION SCHEME

for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – Fourth Year **Semester - VIII**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	EE801	EHV AC/DC Transmission	3	1	-	30	20	50	100	150
2	EE802	Electric Drives and Their Control	3	1	-	30	20	50	100	150
3	EE803	Switchgear & Protection	3	1	-	30	20	50	100	150
4	EE804	Non Conventional Energy Sources	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
5	EE805	Computer Based Power System Lab	-	-	3	50	-	50	50	100
6	EE806	Electrical Drives and Control Lab	-	-	4	100	-	100	50	150
7	EE807	Seminar	-	-	4	100	-	100	50	150
8	EE808	Project Stage II	-	-	4	200	-	200	150	350
9	EE809	Discipline & Cocurricular Activities	-	-	-	-	-	100	-	100
		Total Hours	12	4	18					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1450

BE 101-ENGLISH

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT – I
Short Stories

- . "The Gift of the Magi" by O. Henry
- . "The Fortune-Teller" by Karl Capek
- . "The Nightingale and the Rose" Oscar Wilde

UNIT – II
Short Stories

- . "Dr. Heidegger's Experiment" by Nathaniel Hawthorne
- . "The Three Dancing Goats" by Anonymous
- . "The Accompanist" by Anita Desai

UNIT – III
Poems

- . "Mending Wall" by Robert Frost
- . "This is Going to Hurt Just a Little Bit" by Odgen Nash
- . "Death and Leveler" by James Shirley
- "Last Lesson of the Afternoon" by D. H. Lawrence
- . "Night of the Scorpion" by Nissim Ezekiel

UNIT – IV
Short Plays

- . "The Dear Departed" by Stanley Houghton
- . "Refund" by Fritz Karinthy
- . "Monkey's Paw" by W. W. Jacobs

UNIT – V
Essays

- . "Of Studies" by Francis Bacon
- . "Third Thoughts" by E. V. Lucas
- . "Toasted English" by R. K. Narayana

BE 102-ENGINEERING MATHEMATICS-I

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT – I
Differential Calculus

- Asymptotes (Cartesian Coordinates Only)
- Curvature
- Concavity, Convexity and Point of Inflexion (Cartesian Coordinates Only)
- Curve Tracing (Cartesian and Standard Polar Curves – Cardioids, Lemniscates of Bernoulli, Limacon, Equiangular Spiral)

UNIT – II
Differential Calculus

- Partial Differentiation, Euler's Theorem on Homogeneous Functions
- Approximate Calculations
- Maxima & Minima of Two and More Independent Variables
- Lagrange's Method of Multipliers

UNIT – III
Integral Calculus

- Applications in Finding the Length of Simple Curves
- Surface and Volumes of Solids of Revolution
- Double Integral, Areas & Volumes by Double Integration
- Change of Order of Integration
- Beta Function and Gamma Function (Simple Properties)

UNIT - IV
Differential Equations

- Differential Equations of First Order and First Degree – Variable Separable, Homogeneous Forms, Reducible to Homogeneous Form, Linear Form, Exact Form, Reducible to Exact Form
- Linear Differential Equations of Higher Order with Constant Coefficients Only

UNIT - V
Differential Equations

- Second Order Ordinary Differential Equations with Variables Coefficients
- Homogeneous and Exact Forms
- Change of Dependent Variable
- Change of Independent Variable, Normal Forms
- Method of Variation of Parameter

BE 103-ENGINEERING PHYSICS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

Interference of Light:-

- Interference as superposition of waves in space. Intensity variation. Bright and dark fringes. Fringe width. Conditions for observing interference of Light. Newton's Rings: Theory and experiment for determining wavelength of light and refractive index of liquid
- Michelson's Interferometer: Production of circular & straight line fringes, Determination of wavelength of light, Determination of wavelength separation of two nearby wavelengths

Polarization of Light:- types of polarization, Nicol prism, Double refraction, elliptically and circularly polarized light, Brewster's law, Malus law, Quarter wave and half wave plates.

UNIT - II

Diffraction of Light:

Fresnel diffraction:- narrow slit. Fraunhofer's diffraction:-Single Slit Diffraction: Quantitative description of single slit, Positions of maxima minima and width of central maximum, Intensity variation.

- Diffraction Grating: Construction and theory, Formation of spectrum by plane transmission grating, Missing and overlapping of spectra, Determination of wavelength of light using plane transmission grating
- Resolving Power: Geometrical & Spectral, Reyleigh criterion, Resolving power of diffraction grating,

UNIT – III

Lasers:- Spatial and temporal coherence, Coherence length, Coherent time and 'Q' factor for lightTheory of Laser Action: Einstein's coefficients components of a laser, Threshold condition for laser actionTheory, design and application of He-Ne and Semiconductor lasers

Holography

- Basic theory of holography, Basic requirement of a holographic laboratory
- Application of holography in microscopy and interferrometry

UNIT - IV

Quantum Mechanics:

Origin of quantum nature of light: Black body radiation and photoelectric effect.
Unability of wave theory of light to explain photoelectric effect. Einstein Photoelectric Equation.
De-Broglie Matter waves. Uncertainity principle

- Compton effect and quantum nature of light
- Schrödinger's Wave Equation: Time dependent and time independent cases
- Physical interpretation of wave function and its properties, boundary conditions
- Particle in one and three dimensional boxes

.

UNIT - V

Theory of relativity-Inertial frame of reference , Non-inertial frame of reference, Michelson- Morley experiment, Einstein's special Theory of Relativity Lorentz Transformation, length contraction, time dilation, addition of velocities, variation of mass with velocity, Equivalence of mass and energy.

BE 203-ENGINEERING CHEMISTRY

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

Water

- Common Impurities, Hardness
- Determination of hardness by Clark's test and complexometric (EDTA) method, Degree of hardness

Municipal Water Supply

- Requisites of drinking water, Purification of water, Sedimentation, Filtration, Sterilization, Break point chlorination

Water for Steam Making

- Boiler troubles carry over, Corrosion, Sludge and scale formation and caustic embrittlement

Methods of Boiler Water Treatment

- Preliminary treatments, Preheating, Lime-Soda process, Permutit (Zeolite) process, Deionizer or Demineralizer, Feed water conditioning, Internal treatment, Blow down
- Numerical problems based on water treatment (Lime-Soda process)

UNIT - II

Fuels

- Chemical Fuels: Origin and classification of fuels

Solid Fuels

- Coal, Proximate and ultimate analysis of coal, Significance of the constituents
- ross and net calorific value, Determination of calorific value by Bomb calorimeter
- Coke – Metallurgical, Coke-carbonization process
- Manufacture of coke-beehive Coke oven and byproduct coke ovens

Liquid Fuels

- Advantages, Petroleum and refining of petroleum, Synthetic petrol, Refining and reforming of gasoline
- Knocking, Octane number, Knocking – Anti knocking agents, Cracking

Gaseous Fuels

- Advantages, Manufacture, Composition and calorific value of coal gas and oil gas
- Determination of calorific value by Junker's calorimeter, Flue gas analysis by Orsat Apparatus

UNIT - III

Phase Rule

- Statement, Definition and meaning of the terms involved
- Application to one component system (Water and Sulphur systems)
- Study of two component system (Ag-Pb system)

Polymers

- Plastics: Classifications and constituents of plastics and their uses, Preparation, properties and uses of polyethylene, Bakelite, Teryline and Nylon
- Rubber: natural rubber, Vulcanization, Synthetic rubber viz. Buna-S, Buna-N, Butyl and Neoprene rubbers

Lubricants

- Classification, Types of lubrication, properties and uses
- Viscosity & Viscosity index, flash & fire point, Cloud and pour point, Emulsification

UNIT - IV

Corrosion

- Definition and its significance, Theories of corrosion, Galvanic cell and concentration

cell, Pitting and Stress corrosion, Protection against corrosion, Protective metallic coating

New Engineering Materials

- Brief idea of following: Superconductors, organic electronic materials, Fullerenes and Optical fibers

UNIT - V

Cement

- Manufacturing of Portland cement, Vertical shaft kiln technology
- Chemistry of setting and hardening

Refractories

- Definition, properties, classification, properties of silica and fireclay refractories

Glass

- Preparation, varieties and uses

BE 104-COMPUTER SYSTEMS AND PROGRAMMING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

Introduction

- Types of computers and generations
- Basic architecture of computers and its building blocks
- Input-Output devices, Memories

UNIT - II

Number Systems

- Binary, octal, decimal and hexadecimal representation of numbers
- Integers and floating point numbers
- Representation of characters, ASCII and EBCDIC codes
- Binary Arithmetic: addition, subtraction, complements

UNIT - III

Classification of Computer Languages

- Machine, assembly and high level languages
- Brief idea of operating system
- Assembler, compiler and interpreter

Programming in 'C'

- Need of programming languages, Defining problems
- Flowcharts and algorithm development

UNIT - IV

- Data types, constants, variables, operators and expressions
- Input and output statements, Conditional and control statements, Arrays

UNIT - V

- Structures and unions
- Pointers
- File handling

BE 105-ELECTRICAL AND ELECTRONICS ENGINEERING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

DC Circuits

- Classification of circuit elements, V-I characteristics and current sources – ideal and practical, source conversion
- Kirchoff's voltage and current laws, Loop analysis
- Star-delta and Delta-star transformations, Superposition theorem & Thevenin's theorem

UNIT - II

Single Phase AC Circuits

- Single phase EMF generation, Instantaneous, average and RMS values
- Phase diagram, power and power factor for R, L, C, RL, RC and RLC circuits, complex representation of impedances
- Solution of RLC series, parallel and series-parallel circuits.

Three Phase AC Circuits

- Three phase EMF generation, Star and delta connections, Line and phase quantities
- 3-phase balance circuits – phasor diagram, solution and power measurement

UNIT - III

Single Phase Transformer

- Faraday's law of electromagnetic induction
- Construction and working of transformer
- Ideal transformer: EMF equation, phasor diagram, voltage and current relationship (transformation ratio)

UNIT - IV

p-n Junction Diodes

- Intrinsic and extrinsic semiconductors, open circuited p – n junction and space charge region
- The biased p – n junction and voltage – ampere characteristics

Diode Circuits

- Single phase half wave and bridge rectifiers – peak inverse voltage
- DC and RMS load currents and voltages, ripple factor, Introduction to filters

UNIT - V

Transistor

- PNP and NPN transistors, transistor current components, Common emitter Configuration- input output characteristics
- Transistor operating regions: active region, saturation region and cut off region
- Transistor as an amplifier and a switch

BE 106-PHYSICS LAB

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

OPTICS

1. To determine the wave length of monochromatic light with the help of Fresnel's Biprism.
2. To determine the wave length of Sodium light by Newton's rings.
3. To determine the specific rotation of Glucose (Sugar) solution using a Polarimeter.
4. To determine the wave length of Sodium light by Michelson's Interferometer.
5. To determine the wavelength of prominent lines of mercury by plane diffraction grating with the help of a spectrometer.
6. To determine the dispersive power of material of prism for violet and yellow colors of mercury Light with the help of a spectrometer.
7. To determine the height of water tank with the help of a sextant.
8. To measure the numerical aperture of an optical fiber.
9. To determine the coherent length and coherent time of laser using He-Ne Laser.
10. To determine the profile of He-Ne Laser beam.

ELECTRONICS / ELECTRICAL

11. To convert a galvanometer into an Ammeter of range 1.5 Amps and calibrate it.
12. To convert a galvanometer into an Voltmeter of range 1.5 Volts and calibrate it.
13. To study the variation of semiconductor resistance with temperature and hence determine the band gap of semiconductor in the form of reverse biased P-N junction diode.
14. To determine the specific resistance of the material of a wire by Carey-Foster's bridge.
15. To determine the ferromagnetic constants, retaintivity, permeability and susceptibility by tracing I-H curve using CRO.
16. To study the variation of thermo emf of Iron-Copper thermo couple with temperature.
17. To study the charge & discharge of a condenser and hence determine time constant. (Both current and voltage graphs are to be plotted)
18. To determine the high resistance by the method of leakage, using a Ballistic Galvanometer.
19. To determine dielectric constant of a liquid using moving coil Ballistic Galvanometer with standard parallel plate condenser.
20. Study G. M. counting system and hence study absorption coefficient of Lead using lead sheets.

BE 208-ENGINEERING CHEMISTRY LAB

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

(i) VOLUMETRIC ANALYSIS

1. Determination of Hardness of Water by different methods.
2. Determination of available chlorine in water.
3. Determination of Copper Sulphate Iodometrically.
4. Determination of Ferrous Ammonium Sulphate.
5. Determination of Sodium Hydroxide and Sodium Carbonate in a alkali mixture.

(ii) GRAVIMETRIC ANALYSIS

6. Determination of Barium as Barium Sulphate.
7. Determination of Silver as Silver Chloride.

(iii) PHYSCICO CHEMICAL ANALYSIS

8. Determination of Viscosity of lubricating oil by Redwood Viscometer.
9. Determination of Flash & Fire Point of lubricating oil by Pensky – Martin apparatus.
10. Determination of Cloud and Pour Point of lubricating oil.
11. Determination of Calorific Value of a solid fuel by Bomb Calorimeter.
12. Determination of proximate analysis of Coal.

(iv) PHYSCICO CHEMICAL INSTRUMENTAL ANALYSIS / CHARACTERIZATION

13. Spectrophotometer (UV – Vis) analysis / characterization.
14. Determination of pH by pH meter.
15. Determination of Conductivity of aqueous solutions of salts.
16. Determination of Sodium and Potassium by flame photometer.

BE 107-COMPUTER PROGRAMMING LAB

((L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

1. Simple input output program integer, real character and string. (Formatted & Unformatted)
2. Conditional statement programs (if, if-else-if, switch-case)
3. Looping Program. (for, while, do-while)
4. Program based on array (one, two and three dimensions)
5. Program using Structure and Union.
6. Program using Function (with and without recursion)
7. Simple programs using pointers.
8. File handling.

BE 108-PRACTICAL GEOMETRY

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

1.
   - Lines, Lettering and Dimensioning
   - Scales: Representative factor, plain scales, diagonal scales, scale of chords
   - Conic Sections: Construction of ellipse, parabola and hyperbola by different methods. Normal and Tangents
   - Special Curves: Cycloid, Epicycloids, Hypo-cycloid, Involutes, Archemedian and logarithmic spirals

2.
   - Projections: Types of projection, Orthographic projection, First angle and third angle projection
   - Projection of points and lines, True inclinations and true length of straight lines, Traces of straight lines, Auxiliary planes

3.
   - Projection of planes and solids: Projection of planes, Projection of polyhedra, Pyramids, Cylinder and Cone

4.
   - Sections of Solids: Section of right solids by normal and inclined planes
   - Development of Surfaces: Parallel line and radial line method for right solids

5.
   - Isometric Projections: Isometric Scale, Isometric axes, Isometric projections of planes And simple solids , Introduction to development of surface .

BE 109-WORKSHOP PRACTICE

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

1.**Carpentry Shop**
- ¸ Timber, definition, engineering applications, seasoning and preservation
- ¸ Plywood and ply boards , simple joints

2.**Foundry Shop**
- ¸ Moulding Sands, constituents and characteristics
- ¸ Pattern, definition, materials types, core prints
- ¸ Role of gate, runner, riser, core and chaplets
- ¸ Causes and remedies of some common casting defects like blow holes, cavities, Inclusions etc., module practice.

3.**Welding Shop**
- ¸ Definition of welding, brazing and soldering processes and their applications
- ¸ Oxyacetylene gas welding process, equipment and techniques, types of flames and their applications
- ¸ Manual metal arc welding technique and equipment, AC and DC welding
- ¸ Electrodes: Constituents and functions of electrode coating, welding positions
- ¸ Types of welded joints, common welding defects such as cracks, undercutting, slag inclusion and boring etc., simple welding exercises

4.**Fitting Shop**
- ¸ Files and other common tools materials and classification, fitting exercises.

5.**Smithy Shop**
- ¸ Forging, forging principle, materials
- ¸ Operations like drawing, upsetting, bending and forge welding
- ¸ Use of forged parts

List of jobs to be made in the workshop practice

S. No. List of Experiments

CARPENTRY SHOP
1. T – Lap joint
2. Bridle joint

FOUNDRY SHOP
3. Mould of any pattern
4. Casting of any simple pattern

WELDING SHOP
5. Gas welding practice by students on mild steel flat
6. Lap joint by gas welding
7. MMA welding practice by students
8. Square butt joint by MMA welding
9. Lap joint by MMA welding
10. Demonstration of brazing

MACHINE SHOP PRACTICE

11. Job on lathe with one step turning and chamfering operations
12. Job on shaper for finishing two sides of a job
13. Drilling two holes of size 5 and 12 mm diameter on job used / to be used for shaping
14. Grinding a corner of above job on bench grinder

FITTING AND SMITHY SHOP

15. Finishing of two sides of a square piece by filing
16. Tin smithy for making mechanical joint and soldering of joint
17. To cut a square notch using hacksaw and to drill three holes on PCD and tapping

BE 110-ELECTRICAL AND ELECTRONICS LAB

(L: 0: T: 0: P: 2) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

A. ELECTRICAL LAB

1.Single line diagram of a power system and a distribution sub-station and basic functional study of main components used in power systems.

2.Make house wiring including earthing for 1-phase energy meter, MCB, ceiling fan, tube light, three pin socket and a lamp operated from two different positions. Basic functional study of components used in house wiring.

3.Study the construction and basic working of ceiling fan, single phase induction motor and three phase squirrel cage induction motor. Connect ceiling fan along with regulator and single phase induction motor through auto-transformer to run and vary speed.

4.(a) Basic functional study and connection of moving coil & moving iron ammeters and voltmeters, dynamometer, wattmeter and energy meter.
(b) Run a 3-phase squirrel cage induction motor at no load and measure its voltage, current, power and power factor. Reverse the direction of rotation.

5.Study the construction, circuit, working and application of the following lamps:
(i) Fluorescent lamp, (ii) Sodium vapour lamp, (iii) Mercury vapour lamp, (iv) Halogen lamp and (v) Neon lamp

6.(a) Study the construction and connection of single phase transformer and auto-transformer. Measure input and output voltage and fin turn ratio.
(b) Study the construction of a core type three phase transformer. Perform star and delta connection on a 3-phase transformer and find relation between line and phase voltage.

B. ELECTRONICS LAB

7.Identification, testing and applications of resistors, inductors, capacitors, PN-diode, Zener diode, LED, LCD, BJT, FET, UJT, SCR, Photo diode and Photo transistor.

8.(a) Functional study of CRO, analog & digital multi-meters and function / signal generator.
(b) Study the single phase half wave and bridge rectifier and effects of filters on waveform.

9.Study the BJT amplifier in common emitter configuration. Measure voltage gain, plot gain frequency response and calculate its bandwidth.

10.(a) Study the construction and basic working of SCR.
(b) Study the single phase half wave and bridge controlled rectifier and observe the effect of firing angle on waveform.

BE 201-COMMUNICATION TECHNIQUES

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I
Grammar - Words and Sentences, Verbs / Tenses, Questions / Questions Tags, Modal Verbs, The Passive

UNIT - II
Grammar - The Infinitive and The ING form, Nouns and Articles, Determiners ,Reported Speech, Adjectives and Adverbs

UNIT - III
Grammar - Prepositions, verbs with Prepositions and Adverbs Pronouns ,Relative Clauses, Conditionals, Linking Words

UNIT - IV
Compositions - Essay and Report Writing, Review Writing

UNIT - V
Compositions - Applications, Letter and Précis Writing, Technical Proposal Writing

BE 202-ENGINEERING MATHEMATICS – II

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

Coordinate Geometry of Three Dimensions - Equation of a sphere, Intersection of a sphere and a plane, tangent plane, normal lines, Right circular cone, Right circular cylinder

UNIT - II

Matrices - Rank of a matrix, inverse of a matrix by elementary transformations
. Solution of simultaneous linear equations , Eigen values and Eigen vectors, Cayley – Hamilton theorem (without proof) , Diagonalization of matrix

UNIT - III

Vector Calculus - Scalar and vector field, differentiation & integration of vector functions
. Gradient, Divergence, Curl and Differential Operator, Line, Surface and volume Integrals
. Green's Theorem in a Plane, Gauss' and Stoke's Theorem (without proof) and their Applications

UNIT - IV

Dynamics - Angular Motion, Radial and Transverse Velocities and Accelerations
. Tangential and Normal Accelerations, Rectilinear Motion in Resisting Medium

UNIT - V

Differential Equations - Series Solutions of Second Order Linear Differential Equations with Variable , Coefficients (Complementary Functions only), Partial Differential Equations of First Order, Lagrange's Form, Standard Forms, Charpit's Method

BE 204-ENGINEERING MECHANICS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

- System of forces, Fundamental laws of mechanics, Composition of forces,Free body diagram, Lami's theorem,Moments and couple, Varignon's theorem, condition of equilibrium
- Types of support and loading, reaction, Analysis of simple trusses by methods of joints and method of sections

UNIT - II

- Laws of Coulomb fraction, Ladder, Wedges,Belt friction and rolling,Principle of virtual work and its applications

UNIT - III

- Location of centroid and center of gravity, area moment of inertia, mass moment of inertia,
- Law of machines, Variation of mechanical advantages, efficiency, reversibility of Machine,Pulleys, wheel and axle, wheel and differential axle,Transmission of power through belt and rope

UNIT - IV

Kinematics of Particle

- Rectilinear motion, plane curvilinear motion,Projectile motion,Constrained motion of connected particles

Dynamics of Particle and Rigid Body

- Newton's law of motion,D'Alembert's principle

UNIT - V

Work and Energy - Work, energy (Potential, Kinetic and Spring),Work – Energy relation

- Law of conservation of energy

Impulse and Momentum - Impulse, momentum,Impulse – Momentum relation, Impact

Vibration - Un-damped free vibrations

BE 205-MECHANICAL ENGINEERING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

Basic Concepts

- Thermodynamic systems, properties, work and heat

Working Fluids

- Air and steam, calculation of properties of air as ideal gas for various thermodynamic processes,Use of steam tables and Molier charts for steam properties

First and Second Laws of Thermodynamics

- Non-flow and flow energy equations, second law statements, Carnot cycle,Application of first and second law to ideal gas system subjects to various thermodynamics processes

UNIT - II

Internal Combustion Engines

- Otto and Diesel cycle, thermal efficiency calculations , Classification, two and four stroke engines, construction and working of petrol and diesel , Engines.Introduction to various systems of IC engines

Gas Turbine Plants

- Ideal Bryton cycle, thermal efficiency calculations.,Construction and working of reciprocating and rotary air compressors,Applications of gas turbine plants

UNIT - III

Steam Power Plant

- Simple Rankine cycle, thermal efficiency calculations, classification of steam generators
- Construction and working of low and high pressure boilers,Introduction to various components of thermal power plants

Refrigeration and Air-conditioning

- Psychrometing, use of psychrometric charts,Elementary concepts of refrigeration and air-conditioning,Vapour compression cycle, working principle and schematic diagrams of refrigerators, air coolers, air conditioners and ice plants

UNIT - IV

Manufacturing Processes

- Classification, principle of working, specification, applications of various machine tools, lathe, drilling, shaper and milling machines,Basic descriptions and applications of hot and cold working processes, forging, bending, shearing, drawing and forming operations

UNIT - V

- Foundry Tools, equipments and moulding materials.,Gas welding, arc welding, soldering and brazing

Power Transmission

- Classification and application of mechanical drives like belts ropes, chains and gear, drives (excluding epicyclic trains) and their velocity ratios, Ratio of tension in belts and ropes

.

BE 206-ENVIRONMENTAL STUDIES & DISASTER MANAGEMENT

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

- Do's and Don'ts for prevention of life and property due to earthquake, tsunami, cyclone fire, flood and landslides,Legislative responsibility and community base disaster management

UNIT - II

Introduction,General introduction to environment, biotic and abiotic environment

- Environmental pollution, Adverse effect of pollution n environment, control strategies
- Various acts and regulations for environmental protection

UNIT - III

Water Pollution

- Surface and underground sources of water,Water quality standards, impurities in water and their removal,River water pollution, eutrophication of lakes
- Domestic waste water management,

Air Pollution

- Sources of air pollution, adverse effects on human health,Green house effect, global warming, acid rain, ozone depletion

Ecology

- Basics of species, biodiversity, population dynamics,Energy flow, ecosystems, environmental impact assessment,Renewable sources of energy, Sustainable development

UNIT - IV

Introduction & Basic Concept of Disasters

- Types of disasters and their brief introduction: Natural & Man made disasters , Earthquakes, tsunami, cyclone, flood, drought, landslide,Nuclear, Chemical, Fire and environmental hazards

UNIT - V

Disaster Management Cycle & its Components

- Mitigation and prevention, preparedness,Response (rescue & relief), rehabilitation and recovery
- Disaster vulnerability & risk and its reduction,Maps showing earthquake, cyclone, flood and landslide hazards in India

BE 207-LANGUAGE LAB

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

The content and coverage of the Language Lab. lessons will cover the following:

1. Phonetic symbols and transcription
2. Listening Skills and comprehension
3. Conversation practice, perfecting English sounds, pronunciation, stress and intonation etc.
4. Vocabulary building, synonyms and antonyms, one word for many, words commonly misspelt and mispronounced
5. Practice of Seminar presentation, Group discussion and Interview skills.

BE 209-ENVIRONMENTAL ENGINEERING LAB

(L: 0: T: 0: P: 2) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

1. Measurement of pH of water
2. Measurement of hardness of water
3. Measurement of residual chlorine in water
4. Measurement of conductivity of water
5. Measurement of chlorides in water
6. Measurement of nitrate in water
7. Measurement of fluoride in water
8. Measurement of dissolves oxygen in water
9. Measurement of total solids in sewage
10. Measurement of dissolved solids in sewage
11. Measurement of settelable solids in sewage

BE 210-MACHINE DRAWING

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

1.
- Introduction to machine drawing
- Dimensioning, locations and placing,
- Orthographic projections: First & third angle methods

2. Sheet 1: Orthographic Projections (3 Problems)
3. Sheet 2: Sectional Views (3 Problems)
4. Sheet 3: Riveted joints, lap joints, butt joints, chain riveting, zig-zag riveting
5. Sheet 4: Screw fasteners, different threads, Nuts & bolts locking devices, set screws, foundation
6. Sheet 5: Bearing, Plumber block
7. Lectures on free hand sketches
8. List of free hand sketches
   - Different type of lines
   - Conventional representation of materials
   - Screw fasteners
   - Bearing: Ball, roller, needle, foot step bearing
   - Coupling: Protected type, flange, and pin type flexible coupling
   - Welded joints
   - Belts and pulleys
   - Pipes and pipe joints
   - Valves

B.E III SEMESTER

EE 301 POWER ELECTRONICS – I

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **PN JUNCTION DIODES:** Open-circuited p-n junction and space charge region. The biased p-n junction, volt-ampere characteristics, cut in voltage and effect of temperature on V-I characteristics. Minority carrier density distribution in (i) a forward biased junction and (ii) a reverse biased junction. Diode capacitances. Junction diode switching times and characteristics.

OTHER DIODES: Avalanche breakdown and zener breakdown. Working principles of zener diodes, photo-diodes, light emitting diodes, solar cell and varactor diodes.

Unit2. **ANALYSIS OF DIODE CIRCUITS:** Diode as a circuit element, load line, small signal diode model and large signal diode model. Analysis of half wave and full wave single-phase rectifiers, peak inverse voltage. Various types of filters, their analysis and applications. Voltage multipliers, clipping and clamping circuits.

Unit3. **BIPOLAR JUNCTION TRANSISTORS(BJTs):**p-n-p and n-p-n transistors, transistor current components. Common base (CB) and common emitter (CE) configurations: input & output characteristics, current gains: alpha & beta. Transistor operating regions: active region, saturation region and cutoff region. Common collector configuration. BJT biasing and dc models. Thermal stability and stabilization techniques. Small signal models: h-parameters and hybrid pie models. BJT as a switch. Minority carrier concentration in the base for cut off, active and saturation conditions, transistor switching times and characteristics. Transistor ratings.

Unit4. **FIELD EFFECT TRANSISTORS:** Construction, working, V-I characteristics and transfer characteristics of JFET. MOSFET: Enhancement type and depletion type: construction, working, V-I characteristics, and transfer characteristics. DC analysis of FETs. FET as a voltage variable resistor. FET small signal models. FET as a switch. CMOS.

Unit5. **SMALL SIGNAL AMPLIFIERS:** Analysis of BJT and JFET amplifiers at low frequency:input and out resistances, voltage and current gains. Frequency response of common emitter transistor amplifier at high frequency. Miller's theorem and its dual. Cascaded BJT amplifiers. Darlington pair and Bootstrapped Darlington circuit.

Text/References:

1. M.H Rashid:Power Electronics, circuits devices and applications, PHI,1988.
2. V Subrahmanyam:Power electronics, New Age Inc.Publishers,New Delhi,1996
3. P.C. Sen:Power electronics Tata McGraw-Hill 1987
4. CW Lander:Power electronics,2nd edition, McGrawHill 1987
5. P.S Bimbhra:Power electronics, 2nd Ed. Khanna Publishers,1987
6. M.D.Singh and K.B. Khanchandani:Power electronics, TMH,1998.

EE 302 COMPUTER PROGRAMMING-I

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **PROGRAMMING IN C:** Review of basics of C, structure & pointer type, variables, singly and doubly linked lists, I/O and text file handling, command line arguments.

Unit2. **OOP FUNDAMENTALS:** Concept of class and object, attributes, public, private and protected members, derived classes, single and multiple inheritance,

Unit3. **PROGRAMMING IN C++:** Enhancements in C++ over C in data types, operators and functions. Inline functions, constructors and destructors. Friend function, function and operator overloading.

Unit4. Working with class and derived classes. Single and, multiple and multilevel inheritances and their combinations, virtual functions, pointers to objects.

Unit5. Working with text files, templates, file handling in C++, Input output flags and formatting operations.

Text/References:

1. C.Gottfried :Programming in C, Schaum series
2. E. Balaguruswamy:Programming in C , Tata Mc Graw Hill Publishers.
3. E. Balaguruswamy:Object oriented programming in C++, Tata Mc Graw Hill Publishers.
4. Y. Kanitkar: Let us C, BPB Publishers.

EE 303 CIRCUIT ANALYSIS-I

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **INTRODUCTION:** Introduction to circuit elements and their characteristics. Current and voltage reference. Response of single element, double element and triple element circuits. Resonance, selectivity & Q-factor in ac circuits.
NETWORK ANALYSIS: Network voltages. Mesh & node systems of network equations and their comparison. Graph of network, tree, incidence matrix, fundamental circuit functions, cut sets, f-circuits analysis and f-cut set analysis, node and node pair analysis. Duality. Method of obtaining dual network.

Unit2. **NETWORK THEOREMS:**Thevenin's, Norton's, Superposition, Reciprocity, Compensation, Millman's, Tellegen's, Maximum power transfer and Miller`s theorem.

Unit3. **POLYPHASE CIRCUITS:** General circuit relations: Three phase star, three phase delta, star and delta combination, four wire star connection, balanced three phase voltages and unbalanced impedances. Power and reactive volt-amperes in a 3-phase system. Power relations in AC circuits: Instantaneous power in AC circuits, power factor, apparent power, reactive power, power triangle, complex power.

Unit4. **NON-SINUSOIDAL WAVES:** Complex periodic waves and their analysis by Fourier series. Different kinds of symmetry, determination of co-efficients. Average and effective values of a non-sinusoidal wave, power in a circuit of non-sinusoidal waves of current and voltage, form factor, equivalent sinusoidal wave and equivalent power factor. Response of linear network to non-sinusoidal periodic waves.

Unit5. **TIME DOMAIN AND FREQUENCY DOMAIN ANALYSIS:** Response of networks to step, ramp, impulse, pulse and sinusoidal inputs. Time domain and frequency domain analysis of circuits. Shifting theorem, initial and final value theorems. Special signal waveforms with Laplace transform & applications to circuit operations.

Text/References :

1. Hayt & Kemmerly:Engineering circuit Analysis, TMH
2. J Edminster & M.Nahvi:Theory & Problems of electric circuits, Schaum's series.
3. B.R.Gupta & Vandana Singhal-Fundamentals of Electrical Networks, Wheeler's Pub.
4. K.A.Gangadhar-Circuit theory.
5. Van Valkenburg-Network Analysis. Tata Mc Graw Hill Co.

EE 304 ELECTRICAL MACHINES-I

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **ELECTROMECHANICAL ENERGY CONVERSION:** Basic principles of electromechanical energy conversion. Basic aspects and physical phenomena involved in energy conversion. Energy balance.

Unit2. **DC GENERATORS**: Construction, Types of DC generators, emf equation, lap & wave windings, equalizing connections, armature reaction, commutation, methods of improving commutations, demagnetizing and cross magnetizing mmf, interpoles, characteristics, parallel operation. Rosenberg generator.

Unit3. **DC MOTORS:** Principle, back emf, types, production of torque, armature reaction & interpoles, characteristics of shunt, series & compound motor, DC motor starting. Speed Control of DC Motor: Armature voltage and field current control methods, Ward Leonard method. Braking, losses and efficiency, direct & indirect test, Swinburne's test, Hopkinsion test, field retardation test, single-phase series motor.

Unit4. **TRANSFORMERS:** Construction, types, emf equation. No load and load conditions. Equivalent circuits, Vector diagrams, Open Circuit and Short Circuit tests, Sumpner's back-to-back test, efficiency. voltage regulation, effect of frequency, parallel operation, autotransformers, switching currents in transformers, separation of losses.

Unit5. **POLYPHASE TRANSFORMERS**: Single unit or bank of single-phase units, polyphase connections, Open delta and V connections, Phase conversion: 3 to 6 phase and 3 to 2 phase conversions, Effect of 3-phase winding connections on harmonics, 3-phase winding transformers, tertiary winding.

Text/References:

1. P.S.Bimbhra-Electrical Machinery
2. M.G.Say-performance and Design of AC Machines
3. B.R.Gupta-Fundamentals of electrical machines, A New Age International publishers
4. Nagrath & Kothari-Electrical Machines, TMH

EE 305 ELECTRICAL MEASUREMENTS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **Measuring Instruments:** Moving coil, moving iron, electrodynamic and induction instruments construction, operation, torque equation and errors. Applications of instruments for measurement of current, voltage, single-phase power and single-phase energy. Errors in wattmeter and energy meter and their compensation and adjustment. Testing and calibration of single-phase energy meter by phantom loading.

Unit2. **Polyphase Metering:** Blondel's Theorem for n-phase, p-wire system. Measurement of power and reactive kVA in 3-phase balanced and unbalanced systems: One-wattmeter, two-wattmeter and three-wattmeter methods. 3-phase induction type energy meter. Instrument Transformers: Construction and operation of current and potential transformers. Ratio and phase angle errors and their minimization. Effect of variation of power factor, secondary burden and frequency on errors. Testing of Current Transformers and Potential Transformers. Applications of Current Transformers and Potential Transformers for the measurement of current, voltage, power and energy.

Unit3. **Potentiometers:** Construction, operation and standardization of DC potentiometers – slide wire and Crompton potentiometers. Use of potentiometer for measurement of resistance and voltmeter and ammeter calibrations. Volt ratio boxes. Construction, operation and standardization of AC potentiometer – in-phase and quadrature potentiometers. Applications of AC potentiometers.

Unit4. **Measurement of Resistances:** Classification of resistance. Measurement of medium resistances – ammeter and voltmeter method, substitution method, Wheatstone bridge method. Measurement of low resistances – Potentiometer method and Kelvin's double bridge method. Measurement of high resistance: Price's Guard-wire method. Measurement of earth resistance.

Unit5. **AC Bridges:** Generalized treatment of four-arm AC bridges. Sources and detectors. Maxwell's bridge, Hay's bridge and Anderson bridge for self-inductance measurement. Heaviside's bridge for mutual inductance measurement. De Sauty Bridge for capacitance measurement. Wien's bridge for capacitance and frequency measurements. Sources of error in bridge measurements and precautions. Screening of bridge components. Wagner earth device.

Text/References:

1. A.K.Sawhney: Electrical and Electronic measurements and measuring instruments,Dhanpat Rai & Sons.
2. E.W.Golding: Electrical Measurements.

EE 306 MATHEMATICS-III

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **LAPLACE TRANSFORM:** Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant coefficients with special reference to wave and diffusion equations, digital transforms.

Unit2. **FOURIER TRANSFORM**: Discrete Fourier transform, Fast Fourier transform, Complex form of Fourier transform and its inverse applications, Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation.

Unit3. **FOURIER SERIES:** Expansion of simple functions in Fourier series, half range series, change of interval, harmonic analysis.
CALCULUS OF VARIATION: Functional, strong and weak variations, simple variation problems, Euler's equation

Unit4. **COMPLEX VARIABLES:** Analytic functions, Cauchy–Riemann equations, Elementary conformal mapping with simple applications, Line integral in complex domain, Cauchy's theorem, Cauchy's integral formula.

Unit5. **COMPLEX VARIABLES:** Taylor's series, Laurent's series, poles, Residues. Evaluations of simple definite real integrals using the theorem of residues. Simple contour integration.

Text/References:

1. M.Ray, J.C.Chaturvedi & H.C.Sharma-Differential Equations.
2. Chandrika Prasad-Mathematics for Engineers.
3. Chandrika Prasad-Advanced Mathematics for engineers.
4. B.S.Grewal-Higher engineering mathematics
5. Gokhroo et al; Higher Engg.Maths III Unique Books, Ajmer

EE 307 POWER ELECTRONICS LAB-I

(L: 0: T: 0: P=2) **Max.Marks:100**
Min.Marks:50

1. Study the following devices: (i) Analog & digital multimeter (ii) Function/ Signal generators (iii) Regulated d. c. power supplies (constant voltage and constant current operations) 2. Study of digital storage CRO and store a transient on it.
3. Study of analog CRO, CRO probes, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.
4. Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse Saturation current and static & dynamic resistances.
5. Plot V-I characteristic of zener diode and study zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
6. Plot frequency response curve for audio amplifier and to determine gain bandwidth product.
7. Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of Idss & Vp
8. Plot gain- frequency characteristic of two stages RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.
9. Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.
10. Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their hparameters.
11. Study half wave rectifier and effects of filters on wave. Also calculate ripple factor.
12. Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor.

EE 308 COMPUTER PROGRAMMING LAB-I

(L: 0: T: 0: P=2) **Max.Marks:75**
Min.Marks:38

1. Write a program to find the greatest between four numbers.
2. Write a program to prepare mark sheet of students using structures.
3. Write a C program to read several different names and addresses, re-arrange the names in alphabetical order and print name in alphabetical order using structures.
4. Write a program to implement concatenation of two strings using pointers.
5. Write a program to create a singly link list of ten students names and implement add node, delete node and is empty list operations.
6. Write a program to search a pattern in a given string.
7. Write a Program to read add, subtract and multiply integer matrices.
8. Write a program to calculate the power function (mn) using the function overloading technique; implement it for power of integer and double.
9. Implement file creation and operate it in different modes: seek, tell, read, write and close operations.
10. Using multiple inheritance,prepare students' mark sheet. Three classes containing marks for every student in three subjects. The inherited class generate mark sheet.
11. Write a program to print the following output using FOR loop.

```
1              1
2 2            2 2
3 3 3          3 3 3
4 4 4 4        4 4 4 4
5 5 5 5 5      5 5 5 5 5
```

EE 309 ELECTRICAL CIRCUIT LAB

(L: 0: T: 0: P=2) **Max.Marks:75**
Min.Marks:38

1. Draw the circuit symbols.
2. Verify theorems for A. C. & D. C. circuits.

PSPICE PROGRAMS FOR CIRCUIT ANALYSIS:

3. DC-analyze resistor networks to determine node voltages, components voltages, and component currents.
4. Analyze resistor networks that have several voltage and current sources and variable load resistors.
5. Transient –analyze RC, RL circuits to produce tables of component voltage & current levels for a given set of time instants to produce graphs of voltages & currents versus time.
6. AC-analyze impedance networks to determine the magnitude & phase of node voltages, components voltages and component currents.
7. Determine the magnitude, phase and component voltages and currents in resonant circuits & produce voltage and current v/s frequency graphs.

PROGRAMS FOR CIRCUIT ANALYSIS:

8. Calculate the resistance of a conductor, given its dimensions & resistivity or determine the change in conductor resistance when the temp changes.
9. D.C.-analyze resistor networks to determine all junction voltages, component voltages, and component currents.
10. Transient –analyze RC, RL circuits to produce tables of component voltage & current levels for a given set of time instants.
11. Convert Y-connected resistor networks to delta-connected circuits

EE 310 ELECTRICAL MACHINE LAB-I

(L: 0: T: 0: P=2) **Max.Marks:100**
Min.Marks:50

1. Speed control of D.C. shunt motor by (a) Field current control method and plot the curve for speed vs field current. (b) Armature voltage control method and plot the curve for speed vs armature voltage.
2. Speed control of a D.C. Motor by Ward Leonard method and to plot the curve for speed vs applied armature voltage.
3. To determine the efficiency of D.C. Shunt motor by loss summation (Swinburne's) method.
4. To determine the efficiency of two identical D.C. Machine by Hopkinson's regenerative test.
5. To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.
6. To perform back-to-back test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit.
7. To perform parallel operation of two 1-phase transformers and determine their load sharing.
8. To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.
9. To perform OC & SC test on a 3-phase transformer & find its efficiency and parameters of its equivalent circuit.
10. To perform parallel operation of two 3-phase transformers and determine their load sharing.
11. To study the performance of 3-phase transformer for its various connections, i.e. star/star star/delta delta/star and delta/delta and find the magnitude of 3rd harmonic current.

EE 311 ELECTRICAL MEASUREMENT LAB

(L: 0: T: 0: P=2) **Max.Marks:100**
Min.Marks:50

1. Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (ii) C.R.O. Probes
2. Study working and applications of Megger, Tong-tester, P.F. Meter and Phase Shifter.
3. Measure power and power factor in 3-phase load by (i) Two-wattmeter method and (ii) Onewattmeter method.
4. Calibrate an ammeter using DC slide wire potentiometer.
5. Calibrate a voltmeter using Crompton potentiometer.
6. Measure low resistance by Crompton potentiometer.
7. Measure Low resistance by Kelvin's double bridge.
8. Measure earth resistance using fall of potential method.
9. Calibrate a single-phase energy meter by phantom loading at different power factors.
10. Measure self-inductance using Anderson's bridge.
11. Measure capacitance using De Sauty Bridge.
12. Measure frequency using Wein's bridge.

BE300*SPECIAL MATHMATICS

(For Diploma passed candidates-Common for all branches)

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1
DifferentialCalculus:
Introduction to successive differentiation, maxima and minima Partial Differentiation, Asymptotes, Curvature, envelopes, evolutes, concavity /convexity, singular points, curve tracing.

Unit 2
Integral Calculus: methods of integration, Definite Integral, Rectification and quadrature, Volumes and surfaces of solids of revolution. Mean values of functions, differentiation under sign of integration, Beta and Gamma functions

Unit3
Differential Equations: Differential equations of first order and first degree, Equation of the first order but not of the first degree, linear differential equation with constant coefficients, Homogeneous Linear differential equations, second order differential equation with variable coefficients

Unit4
Matrix algebra: Elementary transformations with application to inverse, Rank and Solution of simultaneous linear equations. Eigen values and Eigen vector,Cayley-Hamilton Theorem and it's applications .

Unit 5
Mechanics:
Statics: Equilibrium of coplanar forces acting at a point, Resultant and Equilibrium of coplanar forces acting on rigid body, friction, Common catenary.
Dynamics: Composition and resolution of velocities and acceleration .Relative velocity. Rectilinear Motion under constant acceleration. Vertical motion under gravity. Simple harmonic motion.

B.E IV SEMESTER

EE 401 POWER ELECTRONICS-II

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **FEEDBACK AMLIFIERS:** Classification, Feedback concept, transfer gain with feedback. General characteristics of negative feedback amplifiers. Analysis of voltage series, voltage shunt, current series and current shunt feedback amplifiers. Stability criterion.

Unit2. **OSCILLATORS:** Classification of oscillators and Criterion for oscillation. RC-phase shift, Hartley, Colpitts, tuned collector, Wein Bridge and crystal oscillators. Astable, monostable and bistable multivibrators. Schmitt trigger.

Unit3. **OP-AMP AND ITS APPLICATIONS:** Operational amplifier: inverting and non-inverting modes. Characteristics of ideal op-amp. Offset voltage and currents. Basic op-amp applications. Differential Amplifier and common mode rejection ratio. Differential DC amplifier and stable ac coupled amplifier. Integrator and differentiator. Analog computation, comparators, sample and hold circuits, logarithmic & antilog Amplifiers and Analog multipliers.

Unit4. **INTEGRATED CIRCUITS:** Precision AC/DC converters-precision limiting, Precision half wave and full wave rectifiers. Active average and peak detectors, A to D and D to A converters. IC 555 timer and its application. Regulated power supplies, Series and shunt voltage regulators, Brief idea of Monolithic regulator.

Unit5. **POWER AMPLIFIERS:** Class –A large signal amplifiers, second harmonic distortion, higher order harmonic generation, Transformer coupled audio power amplifier, collector efficiency. Pushpull amplifier: Class A, Class B and Class AB operations. Comparison of performance with single ended amplifiers

Text/References:

1. M H Rashid:Power Electronics, circuits Devices and Application, Prentice-Hall, 1988.
2. V Subrahmanyam:Power Electronics, New Age Inc.Publishers,New Delhi,1996.
3. P C Sen:Power electronics, Tata McGraw-Hill, india.
4. C W lander:Power electronics, 2nd Ed, McGraw Hill 1987.
5. P S Bimbhra:Power electronics,2nd Ed. Khanna Publishers, New Delhi, 1998.
6. M D Singh and K B Khanchandani:Power electronics, Tata McGraw Hill Publishing Company, New Delhi, 1998.

EE 402 DIGITAL ELECTRONICS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **NUMBER SYSTEMS AND CODES:** Radix and Radix conversions, sign, magnitude & complement notation. Weighted and non-weighted codes, BCD codes, self-complementing codes, cyclic codes, error detecting and correcting codes, ASCII & EBCDIC codes. Alphanumeric codes. Fixed point and floating point arithmetic. BCD arithmetic.

Unit2. **BOOLEAN ALGEBRA AND DIGITAL LOGIC GATES:** Features of Boolean algebra, postulates of Boolean algebra, theorems of Boolean algebra. Fundamental logic gates, derived logic gates, logic diagrams and Boolean expressions. Converting logic diagrams to universal ogic. Positive, negative and mixed logic.

MINIMIZATION TECHNIQUES: Minterm,Maxterm, Karnaugh's maps, simplification of logic functions with K-map, conversions of truth tables in SOP & POS forms, incompletely specified functions, variable mapping, Quinn- Mcklusky method.

Unit3. **SWITCHING CIRCUITS AND LOGIC FAMILIES:** Diode, BJT, FET as switch. Different types of logic families: RTL, TTL, open collector TTL, three state output logic, TTL subfamilies, MOS, CMOS, ECL IIL.

Unit4. **COMBINATION SYSTEMS:** Combinational logic circuit design, Half and full adder & subtractors. Binary serial and parallel adders, BCD adder. Binary multiplier, comparator, decoders, encoders, multiplexer, de-multiplexer, Code converters.

Unit5. **SEQUENTIAL SYSTEMS:** Latches, Flip-Flop: R-S, D, J-K, T, Master slave. Flip-flop conversions. Counters: asynchronous & synchronous counter. Counter design, counter applications. Registers: buffer & shift register.

Text/References:

1. Malvino and Leach-Digital principles and Applications, Tata Mc Graw Hill Co.
2. M.Morris Mano-Digital Logic and computer Design, Tata Mc Graw Hill Co.
3. S.Salivahnan, S.Anvazhagar-Digital circuits and design

EE 403 ELECTRICAL MACHINES-II

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **INTRODUCTION:** General equation of inducted emf, AC armature windings: concentric and distributed winding, chording, skewing, effect on induced emf. Armature and field mmf, effect of power factor and current on armature mmf, harmonics. Rotating fields.

Unit2. **INDUCTION MOTORS:** Construction of squirrel cage & slip ring induction motor, basic principles, flux and mmf waves, induction motor as a transformer. Equivalent circuits, torque equation, torque-slip curves, no load & block rotor tests, circle diagram, performance calculation. Effect of rotor resistance. Cogging, Crawling. Double cage squirrel cage induction motor, induction generator, induction regulator.

Unit3. **STARTING & SPEED CONTROL OF INDUCTION MOTORS:** Various methods of starting & speed control of squirrel cage & slip ring motor, cascade connection, braking.
Single-Phase Induction Motor: Revolving field theory, starting methods, equivalent circuits.

Unit4. **SYNCHRONOUS GENERATOR:** Construction, types, excitation systems, principles. Equation of induced emf, flux and emf waves, theory of cylindrical rotor and salient pole machines, two-reactance theory, phasor diagrams, power developed, voltage regulation, OC & SC tests, zero power factor characteristics, potier triangle and ASA method of finding voltage regulation, synchronization, parallel operation, hunting and its prevention.

Unit5. **SYNCHRONOUS MOTORS:** types, construction, principle, phasor diagrams, speed torque characteristics, power factor control, V-curves, starting methods, performance calculations, applications, synchronous condenser, synchronous induction motor.

Text/References:

1. Dr. P.S. Bimbhra-Electrical Machinery
2. H Cotton-Advance Electrical Technologies
3. M.G.Say-Performance and Design of AC machines
4. I J Nagrath and D P Kothari: Electircal machines.

EE 404 COMPUTER PROGRAMMINNG-II

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **UNIX-** Introduction to following basic commands (excluding shell programming): who, touch, cat, cp, rm, mv, ls, unmask, pwd, mkdir, rmdir, bc, expr, factor, logname, id, uname, try, date, banner, dspace, du, ulimit, passwd, cal, wc, sort, cut, grep, dd, head, pg, lp, tail, compress, man, tee.

Unit2. **VI EDITOR:** Text entry and command modes, cursor movement commands, string replacement commands and set commands.

Unit3. **JAVA:** Variation from C++ to JAVA. Introduction to JAVA bytecode, virtual machine, application, application & applets of Java, integer, floating point, characters, Boolean, literals, and array declarations.

Unit4. **OPERATORS AND CONTROL STATEMENTS:** Arithmetic operators, bitwise operators, relational operators, Boolean logic operators, the assignment operators, ?: operators, operator precedence. Switch and loop statements.

Unit5. **PACKAGE AND INTERFACES:** Packages, access protection, importing & defining packages. Defining and implementing interfaces. I/O APPLETS: I/O basics, reading console I/O, input and print stream classes, applet fundamental and string handling, mouse and keyboard interfaces, awt tools and controls.

Text/References :

1. Yashwant Kanithkar:Unix & Shell programming
2. Patric Naughton:Java 2

EE 405 CIRCUIT ANALYSIS-II

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **IMPEDANCE AND ADMITTANCE FUNCTIONS:** The concept of complex frequency, transform impedance and admittance, series and parallel combinations.
NETWORK FUNCTIONS: Terminals and terminal pairs, driving point impedance transfer functions, poles and zeros. Restrictions on pole and zero location in s-plane. Time domain behavior from pole and zero plot. Procedure for finding network functions for general two terminal pair networks.

Unit2. **NETWORK SYNTHESIS:** Hurwitz polynomial, positive real functions, reactive networks. Separation property for reactive networks. The four-reactance function forms, specification for reactance function. Foster form of reactance networks. Cauer form of reactance networks. Synthesis of R-L and R-C networks in Foster and Cauer forms.

Unit3. **TWO PORT GENERAL NETWORKS:** Two port parameters (impedance, admittance, hybrid, ABCD parameters) and their inter relations. Equivalence of two ports. Transformer equivalent, inter connection of two port networks. The ladder network, image impedance, image transfer function, application to L-C network, attenuation and phase shift in symmetrical T and pi networks.

Unit4. **TWO PORT REACTIVE NETWORK (FILTERS):** Constant K filters. The m-derived filter. Image impedance of m-derived half (or L) sections, composite filters. Band pass and band elimination filters. The problem of termination, lattice filters, Barlett's bisection theorem. Introduction to active filters.

Unit5. **COUPLED CIRCUITS:** Conductively coupled circuits. Mutual impedance, magnetic coupling, mutual inductance, co-efficient of magnetic coupling, circuit directions and sign of mutual inductance, mutual inductance between portions of the same circuit, mutual inductance between parallel branches, transferred impedance. Transformer equivalent inductively and conductively coupled circuits; Resonance in Single tuned and Double tuned circuits, effect of coefficient of coupling.

Text/References:

1. Hayt & Kemmerly-Circuit Analysis, Tata Mc Graw Hill Co
2. J.Edminster & M.Nahvi-Theory & problems of electric circuits,Scaum's out line.
3. B.R. Gupta & V.Singhal-Fundamentals of Electrical networks,Wheeler's Pub.
4. K.A. Gangadhar-Circuit theory.
5. Van Valkenburg-Network Analysis.

EE 406 ADVANCED MATHEMATICS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1. **NUMERICAL ANALYSIS:** Finite differences - Forward backward and central difference. Newton's forward and backward differences interpolation formulae. Sterling's formulae, Lagrange's interpolation formula. Solution of non-linear equations in one variable by Newton Raphson and Simultaneous algebraic equation by Gauss and Regula Falsi method. Solution of simultaneous equations by Gauss elimination and Gauss Seidel methods. Fitting of curves (straight line and parabola of second degree) by method of least squares.

Unit2. **NUMERICAL ANALYSIS:** Numerical differentiation, numerical integration trapezoidal rule, Simpson's one-third and one eighth rule. Numerical Integration of ordinary differential equations of first order, Picard's method, Euler's & modified Euler's methods. Miline's method and Runga Kutta fourth order method. Simple linear difference equations with constant coefficients.

Unit3. **SPECIAL FUNCTIONS:** Bessel's function of first and second kind, simple recurrence relations, orthogonal property of Bessel functions, Transformation, Generating functions, Legendre's function of first kind, simple recurrence relations, orthogonal property, Generating functions.

Unit4. **STATISTICS & PROBABILITY:** Elementary theory of probability, Baye's theorem with simple applications, Expected value. Theoretical probability distributions – Binomial, Poisson and Normal distributions

Unit5. **STATISTICS & PROBABILITY:** Lines of regression, co-relation and rank correlation.
TRANSFORMS: Z-transforms, its inverse, simple properties and application to difference equations.

Text/References :

1. Chandrika Prasad-Advanced mathematics for engineering.
2. B.S.Grewal-Higher engineering mathematics.
3. Gokhroo and Mehta-Advanced Engg. Maths IV (4EE6.1) Unique Books,Ajmer

EE 407 POWER ELECTRONICS LAB-II

(L: 0: T: 0: P=2) **Max.Marks:100**
Min.Marks:50

1. Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1KHz with and without negative feedback.
2. Study of series and shunt voltage regulators and measure line and load regulation and ripple factor.
3. Plot and study the characteristics of small signal amplifier using FET.
4. Push Pull amplifier: To study variation of output power & distortion with load.
5. Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency
6. Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
7. Study the following oscillators and observe the effect of variation of C on oscillator frequency: (i) Hartley (ii) Colpitts
8. (i) Study op-amp in inverting and non-inverting modes. (ii) Use op-amp as scalar, summer and voltage follower.
9. Use of op-amp as differentiator and integrator.
10. Study Op-amp characteristics and get data for input bias current, measure the output-offset voltage and reduce it to zero and calculate slow rate.
11. Obtain a frequency response of filters.
12. Analyze filter circuits to produce voltage frequency & phase-frequency response graphs using PSPICE.

EE 408 DIGITAL ELECTORNICS LAB

(L: 0: T: 0: P=2) **Max.Marks:100**
Min.Marks:50

1. Study of following combinational circuits: Multiplexer, Demultimplexer and Encoder. Verify truth tables of various logic functions.
2. Study of various combinational circuits based on: AND/NAND Logic blocks and OR/NOR Logic blocks.
3. To study various waveforms at different points of a transistor bistable multivibrator and its frequency variation with different parameters.
4. To design a frequency divider using IC-555 timer.
5. To study various types of registers and counters.
6. To study Schmitt trigger circuit.
7. To study transistor astable multivibrator.
8. Experimental study of characteristics of CMOS integrated circuits.
9. Interfacing of CMOS to TTL and TTL to CMOS.
10. BCD to binary conversion on digital IC trainer.
11. Testing of digital IC by automatic digital IC trainer.
12. To study OP-AMP as Current to Voltage & Voltage to Current converters & comparator.

EE 409 ELECTERICAL MACHINES LAB-II

(L: 0: T: 0: P=2) **Max.Marks:100**
Min.Marks:50

1. Separation of transformer core losses and to determine the hystersis and eddy current losses at rated voltage and frequency.
2. To plot the O.C.C. & S.C.C. of an alternator and to determine its regulation by synchronous impedance method.
3. To synchronize an alternator across the infinite bus (RSEB) & summarize the effects of variation of excitation on load sharing.
4. To plot the V-curve for a synchronous motor for different values of loads.
5. To perform sumpner's back-to-back test on 3 phase transformers, find its efficiency & parameters for its equivalent circuits.
6. To perform the heat run test on a delta/delta connected 3-phase transformer and determine the parameters for its equivalent circuit.
7. To perform no load and blocked rotor test on a 3 phase induction motor and to determine the parameters of its equivalent circuits. Draw the circle diagram and compute the following (i) Max. Torque (ii) Current (iii) slip (iv) p.f. (v) Efficiency.
8. To perform the load test on a 3-phase induction motor and determine its performance characteristics (a) Speed vs load curve (b) p.f. vs load curve (c) Efficiency vs load curve (d) Speed vs torque curve
9. Determination of losses and efficiency of an alternator.
10. To find Xd and Xq of a salient pole synchronous machine by slip test.

EE 410 COMPUTER PROGRAMMING LAB – II

(L: 0: T: 0: P=2) **Max.Marks:100**
Min.Marks:50

UNIX

1. Use of advanced vi commands.
2. Sorting of files containing records using sort command.
3. Searching patterns in files.
4. Use of bc, expr, factor commands.
5. Use of head, tail, compress commands.
6. Memory management commands, dfspace, du, ulimit etc.

JAVA

7. Programs based on matrix: addition, multiplication, transpose, check if matrix is symmetric / upper triangular / lower triangular / unit matrix.
8. Representation of complex numbers and their operation: add, multiply; divide, subtraction, magnitude (mod) etc.
9. Complex matrix representation and operation: add, subtract, multiply.
10. Defining packages for sorting algorithms.
11. File handling operations: input from file, output to file, file copy, file concatenation.
12. Mouse and keyboard event handling programs.
13. Programs based on string operations.
14. Drawing in applet and use of buttons check boxes, text fields and labels in applets.

EE 411 HUMANITIES AND SOCIAL SCIENCE

(L: 0: T: 0: P=2) **Max.Marks:50**
Min.Marks:25

INDIA: Salient feature of Indian Constitution, fundamental rights, duties, directive principles of state. History of Indian National Movement, socioeconomic growth after independence.
SOCIETY: Social groups- concept and types, socialization- concept and theory, social control: concept, social problem in contemporary India, status and role.
THE FUNDAMENTALS OF ECONOMICS: meaning, definition and importance of economics, Logic of choice, central economic problems, positive and normative approaches, economic systems socialism and capitalism.
MICROECONOMICS: Law of demand supply, utility approach, indifference curves, elasticity of demand and supply and applications, consumer surplus, Law of returns to factors and returns to scale.
MACROECONOMICS: concepts relating to National product – National income and its measurement, Simple Keynesian theory, simple multiplier, money and banking. Meaning, concept of international trade, determination of exchange rate, Balance of payments.

B. E V- SEMESTER

EE 501 POWER ELECTRONICS-III

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Power Semiconductor Devices:** Characteristics of Power Transistor, Thyristor, GTO, Power MOSFET and IGBT. Two-Transistor Model of Thyristor.
Unit-2 **SCR:** Construction and characteristics, specification and ratings, pulse transformer, optical isolators, methods of turn on: R, RC, UJT relaxation oscillator, Rating extension by series and parallel connections, string efficiency. Protection of SCR-Protection against over voltage, over current, dv/dt, di/dt, Gate protection.
Unit-3 **Converters-I:** Single Phase half & full wave converters with RL load, Single phase dual converters, Three phase half wave converters, Three phase full converters with RL load, Three phase dual converters.
Unit-4 **Converters-II:** Single and three-phase semi converters with RL load. Power Factor Improvement-Extinction angle control, symmetrical angle control, pulse width modulation control and sinusoidal pulse width modulation control. Inversion operation. Effect of load and source impedances.
Unit-5 **DC-DC Converters: Choppers:** Step Up/Down Copper, Chopper Configurations, analysis of type A Chopper Commutation of Choppers. Switched Mode Regulators-buck, boost, buck-boost and cuk regulator.

Text/References :

1. M.H Rashid:Power Electronics, circuits devices and applications, PHI,1988.
2. V Subrahmanyam:Power electronics, New Age Inc.Publishers,New Delhi,1996
3. P.C. Sen:Power electronics Tata McGraw-Hill 1987
4. CW Lander:Power electronics,2nd edition, McGrawHill 1987
5. P.S Bimbhra:Power electronics, 2nd Ed. Khanna Publishers,1987
6. M.D.Singh and K.B. Khanchandani:Power electronics, TMH,1998.

EE 502 MICROPROCESSORS & COMPUTER ARCHITECTURE

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Introduction** : CPU, address bus, data bus and control bus. Input/Output devices, buffers, encoders, latches and memories. Brief introduction to comparison of different features in 8085 and 8086 microprocessors.
Unit-2 **8085 Microprocessor Architecture** : Internal Data Operations and Registers, Pins and Signals, Peripheral Devices and Memory Organization, Interrupts.
Unit-3 **8085 Microprocessor Instructions** : Classification, Format and Timing. Instruction Set. Programming and Debugging, 8 Bit And 16 Bit Instructions.
Unit-4 **8085 Microprocessor Interfacing** : 8259, 8257, 8255, 8253, 8155 chips and their applications. A/D conversion, memory, keyboard and display interface (8279).
Unit-5 **Basic Computer Architecture:** Central Processing Unit, memory and input/output interfacing. Memory Classification: Volatile and non-volatile memory, Primary and secondary memory, Static and Dynamic memory, Logical, Virtual and Physical memory. Types of memory: Magnetic core memory, binary cell, Rom architecture and different types of ROM, RAM architecture, PROM, PAL, PLA, Flash and Cache memory, SDRAM, RDRAM and DDRAM. Memory latency, memory bandwidth, memory seek time.

Text/References :

1. Gaonkar:Microprocessors.
2. Douglas Hall:Digital Electronics & Microprocessors
3. B.Ram.Microprocessors.
4. Morris Mono:digital electronics.

EE503 CONTROL SYSTEMS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Introduction:** Elements of control systems, concept of open loop and closed loop systems., Examples and application of open loop and closed loop systems, brief idea of multivariable control systems.
Unit-2 **Mathematical Modeling of Physical Systems:** Representation of physical system (Electro Mechanical) by differential equations, Determination of transfer function by block diagram reduction techniques and signal flow method, Laplace transformation function, inverse Laplace transformation.
Unit-3 **Time Response Analysis of First Order and Second Order System:** Characteristic equations, response to step, ramp and parabolic inputs, transient response analysis, steady state errors and error constants, Transient & steady state analysis of LTI systems.
Unit-4 **Stability of the System:** Absolute stability and relative stability, Routh's stability criterion, root locus method of analysis, polar plots, Nyquist stability criterion. M and N Loci, Nichols chart.
Unit-5 **Elementary Ideas of Compensation, Networks:** Lag, lead and log lead networks, brief idea of proportional, derivative and integral controllers.

Text/References :

1. I J Nagrath and M Gopal : Control systems Engineering, 3rd Ed, New Age Publication.
2. K Atsuhiko Ogata:Modern control engineering. PHI

EE 504 GENERATION OF ELECTRICAL POWER

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Conventional Energy Generation Methods** : **(i) Thermal Power plants:** Basic schemes and working principle. **(ii) Gas Power Plants:** open cycle and closed cycle gas turbine plants, combined gas & steam plants – basic schemes. **(iii) Hydro Power Plants:** Classification of hydroelectric plants. Basic schemes of hydroelectric and pumped storage plants. **(iv) Nuclear Power Plants:** Nuclear fission and Nuclear fusion. Fissile and fertile materials. Basic plant schemes with boiling water reactor, heavy water reactor and fast breeder reactor. Efficiencies of various power plants.

Unit-2 **New Energy Sources** : Impact of thermal, gas, hydro and nuclear power stations on environment. Green House Effect (Global Warming). Renewable and non-renewable energy sources. Conservation of natural resources and sustainable energy systems. Indian energy scene. Introduction to electric energy generation by wind, solar and tidal.

Unit-3 **(i) Loads and Load curves:** Types of load, chronological load curve, load duration curve, energy load curve and mass curve. Maximum demand, demand factor, load factor, diversity factor, capacity factor and utilization. **(ii) Power factor improvement** : Causes and effects of low power factor and advantages of power factor improvement. Power factor improvement using shunt capacitors and synchronous condensers.

Unit-4 **Power Plant Economics: (i)** Capital cost of plants, annual fixed and operating costs of plants, generation cost and depreciation. Effect of load factor on unit energy cost. Role of load diversity in power system economics. **(ii)** Calculation of most economic power factor when (a) kW demand is constant and (b) kVA demand is constant. **(iii) Energy cost reduction:** off peak energy utilization, co-generation, and energy conservation.

Unit-5 **(i) Tariffs:** Objectives of tariffs. General tariff form. Flat demand rate, straight meter rate, block meter rate. Two part tariff, power factor dependent tariffs, three-part tariff. Spot (time differentiated) pricing. **(ii) Selection of Power Plants:** Comparative study of thermal, hydro, nuclear and gas power plants. Base load and peak load plants. Size and types of generating units, types of reserve and size of plant. Selection and location of power plants.

Text/References :

1. B.R. Gupta-Generation of electrical energy
2. Soni, Gupta and Bhatnagar-Generation of electrical power.
3. S.L. Uppal-Electrical power.
4. M.V. Deshande:Elements of electrical power station design.

EE 505 TRANSMISSION & DISTRIBUTION OF ELECTRICAL POWER

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **(i) Supply systems: -** Basic network of power system. Transmission and distribution voltage, effect of system voltage on size of conductor and losses. Comparison of DC 2- wire, DC 3-wire, 1- phase AC and 3- phase AC (3- wire and 4- wire) systems. **(ii) Distribution Systems** : -Primary and secondary distribution systems, feeder, distributor and service mains. Radial and ring- main distribution systems. Kelvin's law for conductor size.

Unit-2 **Mechanical features of overhead lines:-** Conductor material and types of conductor. Conductor arrangements and spacing. Calculation of sag and tension, supports at different levels, effect of wind and ice loading, stringing chart and sag template. Conductor vibrations and vibration dampers.

Unit-3 **Parameters of Transmission Lines:** Resistance inductance and capacitance of overhead lines, effect of earth, line transposition. Geometric mean radius and distance. Inductance and capacitance of line with symmetrical and unsymmetrical spacing Inductance and capacitance of double circuit lines. Skin and proximity effects. Equivalent circuits and performance of short and medium transmission lines **.**

Unit-4 **(i)** Generalized ABCD line constants, equivalent circuit and performance of long transmission line. Ferranti effect. Interference with communication circuits. Power flow through a transmission line **(ii) Corona:** Electric stress between parallel conductors. Disruptive critical voltage and visual critical voltage, Factors affecting corona. Corona power loss. Effects of corona.

Unit-5 **(i) Insulators:** Pin, shackle, suspension, post and strain insulators. Voltage distribution across an insulator string, grading and methods of improving string efficiency **. (ii) Underground Cables:** Conductor, insulator, sheathing and armoring materials. Types of cables. Insulator resistance and capacitance calculation. Electrostatic stresses and reduction of maximum stresses. Causes of breakdown. Thermal rating of cable. Introduction to oil filled and gas filled cables.

Text/References :

1. A.S. Pabla:Electric power distribution.
2. B.R. gupta:Power system analysis and design
3. Soni, Gupta and Bhatnagar:A course in electrical power.
4. C.L. Wadhwa:Electrical power systems
5. Nagrath kothan:Modern power system analysis
6. J.J. Grainger & W.D. Stevenson:Power system analysis

EE 506 ADVANCED DISTRIBUTION SYSTEM

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **(i) Distribution Systems:** Distribution of power, future distribution systems, power loads. **(ii) Load Forecasting:** Introduction, load survey, load forecasting-regression analysis, correlation theory, analysis of time series, load growth factors, sources of error.

Unit-2 **Operation:** Operation criterion and standards: Voltage control – voltage regulation, kVA –km conductor loading, correction of system voltage. Harmonics – introduction, effects of harmonics on networks, limits of harmonics, filters. Load variations- causes of voltage fluctuations, measures to reduce flickering. Ferro resonance. System losses - introduction, losses in components, measurement of losses, reduction of losses. Energy management.

Unit-3 **Distribution Power Capacitors:** Reactive power flow, monitoring and compensation in distribution system, maintaining system voltage. Series and shunt capacitors, comparison. Shunt capacitors in distribution system - LT and HT shunt capacitors, capacitor rating for power factor improvement, constructional features. System harmonics.

Unit-4 **Grounding:** Grounding system, earth and safety, earth electrode- earth resistance calculation, effect of rod size and soil resistivity, earth conductor sizes. Introduction to earth electrode design. Brief description of system earthing – system neutral earthing, earthing of substations, lines and consumer premises. Earth fault protection of feeders.

Unit-5 **Distribution Automation:** Introduction to distribution automation. Concept of communication-power line carrier, radio communication, fibre optics, satellite communication and sensors. Introduction to supervisory control and data acquisition (SCADA). Brief descriptor of an automation system.

EE 507 POWER ELECTRONICS LAB-III

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1 Study the comparison of following power electronics devices regarding ratings, performance characteristics and applications: Power Diode, Power Transistor, Thyristor, Diac, Triac, GTO, MOSFET, MCT and SIT.

2 Determine V-I characteristics of SCR and measure forward breakdown voltage, latching and holding currents.

3 Find V-I characteristics of TRIAC and DIAC.

4 Find output characteristics of MOSFET and IGBT.

5 Find transfer characteristics of MOSFET and IGBT.

6 Find UJT static emitter characteristics and study the variation in peak point and valley point.

7 Study and test firing circuits for SCR-R, RC and UJT firing circuits.

8 Study and test 3-phase diode bridge rectifier with R and RL loads. Study the effect of filters.

9 Study and obtain waveforms of single-phase half wave controlled rectifier with and without filters. Study the variation of output voltage with respect to firing angle.

10 Study and obtain waveforms of single-phase half controlled bridge rectifier with R and RL loads. Study and show the effect of freewheeling diode.

11 Study and obtain waveforms of single-phase full controlled bridge converter with R and RL loads. Study and show rectification and inversion operations with and without freewheeling diode.

12 Control the speed of a dc motor using single-phase half controlled bridge rectifier and full controlled bridge rectifier. Plot armature voltage versus speed characteristics.

EE 508 MICROPROCESSOR LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1 Study the hardware, functions, memory structure and operation of 8085 Microprocessor kit.
2 Program to perform integer division: (1) 8-bit by 8-bit (2) 16 bit by 8 bit.
3 Transfer of a block of data in memory to another place in memory
4 Transfer of black to another location in reverse order.
5 Searching a number in an array.
6 Sorting of array in: (1) Ascending order (2) Descending order.
7 Finding party of a 32-bit number.
8 Program to perform following conversion (1) BCD to ASCII (2) BCD to hexadecimal.
9 Program to multiply two 8–bit numbers
10 Program to generate and sum 15 Fibonacci numbers.
11 Program for rolling display of message "India", "HELLO".
12 To insert a number at correct place in a sorted array.
13 Reversing bits of an 8-bit number.
14 Fabrication of 8-bit LED interfaces for 8085 kit through 8155 and 8255.
15 Data transfer on output port 8155 & 8255 & implementation of disco light, running light, and sequential lights on the above mentioned hardware.
16 Parallel data transfer between two DYNA-85 kit using 8253 ports.
17 Generation of different waveform on 8253/8254 programmable timer.

EE 509 MATLAB PROGRAMMING LAB

(L: 0; T: 0; P=2) **Max.Marks:75**
Min.Marks:38

1 Basics of MATLAB matrices and vectors, matrix and array operations, Saving and loading data, plotting simple graphs, scripts and functions, Script files, Function files, Global Variables, Loops, Branches, Control flow, Advanced data objects, Multi-dimensional matrices, Structures, Applications in linear algebra curve fitting and interpolation. Numerical integration, Ordinary differential equation. (All contents is to be covered with tutorial sheets)
2 **Simulink:** Idea about simulink, problems based on simulink. (All contents is to be covered with tutorial sheets)

EE 510 POWER SYSTEM DESIGN

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1 Generating station design **:** Design considerations and basic schemes of hydro, thermal, nuclear and gas power plants. Electrical equipment for power stations,
2 Auxiliary power supply scheme for thermal power plant.
3 Distribution system Design: Design of feeders & distributors. Calculation of voltage drops in distributors. Calculation of conductor size using Kelvin's law.
4 Methods of short term, medium term and long term load forecasting.
5 Sending end and receiving end power circle diagrams.
6 Instrument Transformers: Design considerations of CTs & PTs for measurement and protection.
7 Substations: Types of substations, various bus–bar arrangements **.** Electrical equipment for substations.

EE 511 ENTREPRENEURSHIP DEVELOPMENT

(L: 0; T: 0; P=2) **Max.Marks:75**
Min.Marks:38

1 Definition of entrepreneur, qualities of a successful entrepreneur, Charms of being an entrepreneur, achievement- motivation, leadership and entrepreneurial competencies.
2 Decision-making, procedures and formalities for starting own business, financial support system.
3 Identification and selection of business opportunities and market survey, business plan. Implementation and customer satisfaction.
4 Business crises, problem-solving attitude, communication skill. Government policies for entrepreneurs.
5 Knowledge based enterprises, Scope of entrepreneur in present context, area of future entrepreneurship.
6 Marketing & Sales Promotion, Techno-Economic Feasibility Assessment by Preparation of Preliminary & Detailed project report.

B. E. VI- SEMESTER
EE 601 MODERN CONTROL THEORY

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Introduction:** Concept of Linear vector space Linear Independence, Bases & Representation, domain and range. Concept of Linearity, relaxedness, time invariance, causality.

Unit-2 **State Space Approach of Control System Analysis:** Modern Vs conventional control theory, concept of state, state variable state vector, state space, state space equations, Writing state-space equations of mechanical, Electrical systems, Analogous systems.

Unit-3 State Space Representation using physical and phase variables, comparison form of system representation. Block diagram representation of state model. Signal flow graph representation. State space representation using canonical variables. Diagonal matrix. Jordan canonical form, Derivation of transfer function from state-model.

Unit-4 **Solution of State Equations:** Diagonalization, Eigenvalues and eigen vectors. Matrix exponential, State transition matrix, Properties of state transition matrix. Computation of State transition matrix concepts of controllability & observability. Pole placement by state feedback, Ackerman's formula

Unit-5 **Digital Control Systems:** Introduction, sampled data control systems, signal reconstruction, difference equations. The z-transform, Z-Transfer Function. Block diagram analysis of sampled data systems, z and s domain relationship, digital PID controller

Text/References :

1. I J Nagrath and M Gopal : Control systems Engineering, 3rd Ed, New Age Publication.
2. K Atsuhiko Ogata:Modern control engineering. PHI

EE 602 HIGH VOLTAGE ENGINEERING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **(i) Breakdown in Gases:** Introduction to mechanism of breakdown in gases, Townsend's breakdown mechanism. Breakdown in electromagnetic gases. Application of gases in power system.
(ii) Breakdown in Liquids: Introduction to mechanism of breakdown in liquids, suspended solid particle mechanism and cavity breakdown. Application of oil in power apparatus.
(iii) Breakdown in solids: Introduction to mechanism of breakdown in solids, electromechanical breakdown, treeing & tracking breakdown and thermal breakdown.
Unit-2 **(i) High DC Voltage Generation:** Generation of high dc voltage, basic voltage multiplier circuit.
(ii) High AC Voltage Generation: Cascaded Transformers.
(iii) Impulse Voltage generation: Impulse voltage, basic impulse circuit, Mark's multistage impulse generator.
(iv) Measurement of High Voltage: Potential dividers - resistive, capacitive and mixed potential dividers. Sphere gap- Construction and operation. Klydonorgraph.
Unit-3 **Nondestructive Insulation Tests: (i)** Measurement of resistively, dielectric constant and loss factor. High Voltage Schering Bridge- measurement of capacitance and dielectric loss.
(ii) Partial Discharges: Introduction to partial discharge, partial discharge equivalent circuit. Basic wide-band and narrow band PD detection circuits.
Unit-4 **(i) Over voltages:** Causes of over voltages, introduction to lightning phenomena, over voltages due to lighting.
(ii) Travelling Waves: Travelling waves on transmission lines-open end line, short circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at a T-junction and line terminated through a capacitance. Attenuation of tavelling waves.
Unit-5 **(i) Over Voltage Protection:** Basic construction and operation of ground wires- protection angle and protective zone, ground rods, counterpoise, surge absorber, rod gap and arcing horn,
lighting arresters - expulsion type, non -linear gap type and metal oxide gapless type.
(ii) Insulation Coordination: Volt - time curves, basic impulse insulation levels, coordination of insulation levels.

Text/References :

1. Thaper, High voltage Engg.
2. Wadhwa:High voltage Engg.
3. Kamaraj Naidu:High voltage Engg.
4. Richjovij:High voltage Engg.

EE 603 PROTECTION OF POWER SYSTEM

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **(i)** Causes and consequences of dangerous currents: Faults, overloads and switching over currents. Introduction to protection, trip circuit of a circuit breaker. Functional characteristics of a relay, zone of protection, primary and backup protection.
(ii) CTs & PTs: Current transformer construction, measurement and protective CTs. Type of potential transformers. Steady state ratio and phase angle errors in CTs and PTs. Transient errors in CT and CVT (Capacitive Voltage Transformer).
Unit-2 **Overcurrent Protection:** HRC fuse and thermal relay. Overcurrent (OC) relays –instantaneous, definite time, inverse time and inverse definite minimum time overcurrent relays, time and current gradings. Induction disc type relay. Directional overcurrent relay, 30 , 60 and 90 connections. Earth fault relay. Brief description of overcurrent protective schemes for a feeder, parallel feeders and ring mains.
Unit-3 **Generator Protection:** Stator protection – differential and percentage differential protection, protection against stator inter-turn faults, stator overheating protection. Rotor protection-protection against excitation and prime mover failure, field earth fault and unbalanced stator currents (negative sequence current protection).
Unit-4 **(i) Transformer Protection:** Percentage differential protection, magnetizing inrush current, percentage differential relay with harmonic restraint. Buchholz relay. Differential protection of generator transfer unit.
(ii) Busbar Protection: Differential protection of busbars, high impedance relay scheme, frame leakage protection.
Unit-5 **(i) Transmission Line Protection:** Introduction to distance protection. Construction, operating principle and characteristics of an electromagnetic impedance relay. Effect of arc resistance. Induction cup type reactance and mho relays. Comparison between impedance, reactance and mho relays. Three stepped distance protection of transmission line.
(ii) Induction Motor Protection: Introduction to various faults and abnormal operating conditions, unbalance supply voltage and single phasing. Introduction to protection of induction motors- HRC fuse and overcurrent, percentage differential, earth fault and negative sequence voltage relays.

Text/References :

1. M Chander:Switchgear protection
2. S S Rao:Switchgear & protection
3. T M S Rao:Static Relays

EE 604 ADVANCED POWER ELECTRONICS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **AC Voltage Controllers:** Principle of On-Off Control, Principle of Phase control, SinglePhase Bi-directional Controllers with Resistive Loads, Single Phase Controllers with Inductive Loads, Three Phase full wave AC controllers, AC Voltage Controller with PWM Control.
Unit-2 **Inverters:** Principle of Operation, Single-phase bridge inverters, Three phase bridge Inverters: 180 and 120 degree of conduction. Voltage control of Single Phase and Three Phase Inverters, Current Source Inverters, Harmonics and its reduction techniques.
Unit-3 **Cycloconverters:** Basic principle of operation, single phase to single phase, three-phase to three-phase and three phase to single phase cycloconverters. Output equation, Control circuit.
Unit-4 **DC Power Supplies:** Switched Mode DC Power Supplies, flyback converter, forward converter, half and full bridge converter, resonant DC power supplies, bi-directional power supplies.
Unit-5 **AC Power Supplies:** Switched mode power supplies, Resonant AC power supplies, bi-directional AC power supplies. Multistage conversions, Control Circuits: Voltage ModeControl, Current Mode Control

Text/References :

1. M.H Rashid:Power Electronics, circuits devices and applications, PHI,1988.
2. V Subrahmanyam:Power electronics, New Age Inc.Publishers,New Delhi,1996
3. P.C. Sen:Power electronics Tata McGraw-Hill 1987
4. CW Lander:Power electronics,2nd edition, McGrawHill 1987
5. P.S Bimbhra:Power electronics, 2nd Ed. Khanna Publishers,1987
6. M.D.Singh and K.B. Khanchandani:Power electronics, TMH,1998.

EE 605 DATA STRUCTURES IN C

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Performance Measurement:** Space complexity and Time complexity, big oh, omega and theta notations and their significance. Linear Lists **- Array** and linked representation, singly & doubly linked lists. Concept of circular linked lists.
Unit-2 **Array & Matrices:** Row and Column Major mapping & representation, irregular 2D array, Matrix operations, Special matrices: diagonal, tri-diagonal, triangular and symmetric. Sparse matrices representation and its transpose.
Unit-3 **Stacks:** Representation in array & linked lists, basic operation, Applications of stacks in parenthesis matching, towers of Hanoi etc. Queues - Representation in array & linked lists, applications, circular queues.
Unit-4 **Trees:** Binary Tree, representation in array & linked lists, basic operation on binary trees, binary tree traversal (preorder, post order, in order). Search Trees - Binary search tree, indexed-binary search tree, basic operation, AVL tree, B-tree & Heap Tree.
Unit-5 **Graphs:** Representation of unweighted graphs, BFS, DFS, and Minimum cost spanning trees, Single source shortest path. Sorting - Bubble sort, insertion sort, merge sort, selection sort, quick sort, heap sort.

Text/References :

EE 606 POWER SYSTEM INSTRUMENTATION

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Theory of Errors:** Accuracy and precision, systematic and random errors, limits of error, probable error and standard deviation. Gaussian error curves, combination of errors.
Unit-2 **Transducers:** Construction & Operating Characteristics of active and digital transducers, Measurement of temperature, pressure, displacement, acceleration, noise level, Instrumentation for strain, displacement, velocity, acceleration, force, torque and temperature.
Unit-3 **Signal Conditioning:** Instrumentation amplifiers, isolation amplifiers, analog multipliers, analog dividers, function generators, timers, sample and hold, optical and magnetic isolators, frequency to voltage converters, temperature to current converters. Shielding and grounding.
Unit-4 **Power System Instrumentation-I:** Measurement of voltage, current, phase angle, frequency, active power and reactive power in power plants. Energy meters and multipart tariff meters.
Unit-5 **Power System Instrumentation-II:** Capacitive voltage transformers and their transient behavior, Current Transformers for measurement and protection, composite errors and transient response.

Text/References :

1. R.HC erni and L.E. Foster: Instrumentation for Engineering Measurements, John Wiley and Sons.
2. H.N. Norton : Handbook of Transducers for Electrical Measuring System, Prentice Hall.
3. Curtis and D.Hohnson : Process Control Instrumentation Technology, John Wiley and sons, Inc.
4. A Aarrilliaga and D.A. Bradley and PS Bodger, Power System Harmonics john Wiley and Sons.
5. R. Morrison : Instrumentation Fundamental and Applications, John Wiley and sons, 1984.
6. R. Morrison : Grounding and shielding Techniques in Instrumentation, 3rd., Ed. John Wiley.

EE 607 CONTROL SYSTEM LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1 Introduction to MATLAB Computing Control Software.
2 Defining Systems in TF, ZPK form.
3 (a) Plot step response of a given TF and system in state-space. Take different values of damping ratio and w natural undamped frequency. (b) Plot ramp response.

4 For a given 2 order system plot step response and obtain time response specification.
5 To design 1st order R-C circuits and observe its response with the following inputs and trace the curve. (a) Step (b) Ramp (c) Impulse
6 To design 2nd order electrical network and study its trarient response for step input and following cases. (a) Under damped system (b) Over damped System. (c) Critically damped system.
7 To Study the frequency response of following compensating Networks, plot the graph and final out corner frequencies. (a) Log Network (b) Lead Network (c) Log-lead Network.
8 To draw characteristics of a.c servomotor
9 To perform experiment on Potentiometer error detector.
10 Check for the stability of a given closed loop system.
11 Plot bode plot for a 2 order system and find GM and PM.

EE 608 POWER SYSTEM LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1 Study the burden effect on the performance of CT and measure ratio error.
2 Find out the sequence components of currents in three 1-Phase transformers and 3-Phase transformer and compare their results.
3 (i) Study over current relay.
(ii) Draw the current-time characteristic of an over current relay for TMS=1 & 0.5 and PSM=1.25 & 1.0.
4 (i) Study percentage bias differential relay.
(ii) Plot the characteristics of a percentage bias differential relay for 20%, 30% and 40% biasing.
5 Study gas actuated Buchholz relay.
6 Study under frequency relay and check it's setting experimentally.
7 Design a HV transmission line.
8 Study a typical grid substation.
9 Study earthing of power station, substation and building

EE 609 DATA STRUCTURES LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1 Simple array and sorting algorithm implementations.
2 Addition, multiplication and transpose of sparse matrices represented in array form.
3 Polynomial addition, multiplication (8 degree polynomials), using array & linked lists.
4 Implementation of stack and queue using array & linked lists.
5 Implementation of circular queue using array.
6 Infix to postfix/prefix conversion.
7 Binary search tree creation and traversing.
8 Generation of spanning trees for a given graph using BFS & DFS algorithms.
9 AVL tree implementation (creation, insertion, deletion).
10 Symbol table organization (Hash Table).
11 Simple array and sorting algorithm implementations.
12 Basic operation over linked list (add node, delete node).

EE 610 ADVANCED POWER ELECTRONICS LAB

(L: 0; T: 0; P=2) **Max.Marks:75**
Min.Marks:38

1 Study and test AC voltage regulators using triac, antiparallel thyristors and triac & diac.
2 Study and test single phase PWM inverter.
3 Study and test buck, boost and buck- boost regulators.
4 Study and test MOSFET chopper.
5 Study and test Zero voltage switching.
6 Study and test SCR DC circuit breaker.
7 Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic.
8 Control speed of a single-phase induction motor using single phase AC voltage regulator.
9 (i) Study single-phase dual converter. (ii) Study speed control of dc motor using single-phase dual converter.
10 Study one, two and four quadrant choppers (DC-DC converters).
11 Study speed control of dc motor using one, two and four quadrant choppers.
12 Study single-phase cycloconverter.

EE 607 HIGH VOLTAGE ENGINEERING LAB

(L: 0; T: 0; P=2) **Max.Marks:75**
Min.Marks:38

1 Study filtration and Treatment of transformer oil.
2 Determine dielectric strength of transformer oil.
3 Determine capacitance and dielectric loss of an insulating material using Schering bridge.
4 Study solid dielectrics used in power apparatus.
5 Study applications of insulating materials.
6 Study direct testing and indirect testing of circuit breakers.
7 Study high voltage testing of electrical equipment: line insulator, cable, bushing, power capacitor, and power transformer.
8 Design an EHV transmission line.

B. E. VII- SEMESTER
EE 701 DATA BASE MANGEMENT SYSTEM

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 Introduction, need, purpose and goals of DBMS. DBMS Architecture, Concept of keys, Generalization and specialization, introduction to relational data model, ER modeling, concept of ER diagram.
Unit-2 **Database Design:** Conceptual Data Base design. Theory of normalization, Primitive and composite data types, concept of physical and logical databases, data abstraction and data independence, relational algebra and relational calculus.
Unit-3 SQL, DDL and DML. Constraints assertions, views database security. Application Development using SQL: Host Language interface, embedded SQL programming. GL's,Forms management and report writers. Stored procedures and triggers. Dynamic SQL, JDBC.
Unit-4 **Internal of RDBMS:** Physical data organization in sequential, indexed, random and hashed files. Inverted and multilist structures.
Unit-5 **(i) Transaction Management:** Transaction concept, transaction state, serializability, conflict serializabiltiy, view serializability. **(ii) Concurrency Control:** Lock based protocol. **(iii) Deadlock Handling:** Prevention detection, recovery. **(iv) Recovery System:** Log based recovery.

Text/References :

EE 702 POWER SYSTEM ANALYSIS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 (i) Percent and per unit quantities. Single line diagram for a balanced 3-phase system. **(ii) Admittance Model:** Branch and node admittances Equivalent admittance network and calculation of Y Modification of an existing Y

Unit-2 **(i) Impendence Model:** Bus admittance and impedance matrices. Thevenin's theorem and Z Direct determination of Z Modification of an existing bus. **(ii) Symmetrical fault Analysi** Transient on a Transmission line, short circuit of a synchronous machine on no load, short circuit of a loaded synchronous machine. Equivalent circuits of synchronous machine under transient and steady state conditions. Selection of circuit breakers, Algorithm for short circuit studies. Analysis of 3 phase faults.

Unit-3 **(i) Symmetrical Components:** Fortescure theorem, symmetrical component transformation. Phase shift in star-delta transformers. Sequence Impedances of transmission lines, Synchronous Machine and Transformers, zero sequence network of transformers and transmission lines. Construction of sequence networks of power system. **(ii) Fault Analysis:**Analysis of single line to ground faults using symmetrical components, connection of sequence networks under the fault condition.

Unit-4 **Unsymmetrical Fault Analysis:** (i) Analysis of line-to-line and double line to ground faults using symmetrical components, connection of sequence networks under fault conditions.

(ii) Analysis of unsymmetrical shunt faults using bus impedance matrix method.

Unit-5 **Load Flow Analysis:** Load flow problem, development of load flow equations, bus classification. Gauss Seidel, Newton Raphosn, decoupled and fast decoupled methods for load flow analysis. Comparison of load flow methods.

Text/References :

1. J.J. Grainger,William, D.Stevenson Jr Power system Analysis.
2. C L Wadhwa, Electrical power system.
3. Nagrath and kotari, power system engineering

EE 703 ARTIFICIAL INTELLIGENCE TECHNIQUES

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Artificial Intelligence:** Introduction to AI and knowledge based Expert systems: Introduction, Importance and Definition of AI, ES, ES building tools and shells.
Unit-2 **Knowledge Representation:** Concept of knowledge, Representation of knowledge using logics rules, frames. Procedural versus. Declarative knowledge, forward versus backward
chaining. Control Strategies: -Concept of heuristic search, search techniques depth first search, Breath first search, Generate & test hill climbing, best first search.
Unit-3 **Artificial Neural Network:** Biological Neurons and synapses, characteristics Artificial Neural Networks, types of activation functions. **Perceptions:** Perception representation, limitations of perceptrons. Single layer and multiplayer perceptrons. Perceptron learning algorithms.
Unit-4 **Basic Concepts in Learning ANN:** Supervised learning, Back propagation algorithm, unsupervised learning, Kohonen's top field network & Algorithm.
Unit-5 **Fuzzy Logic:** Fuzzy logic concepts, Fuzzy relation and membership functions, Defuzzufication, Fuzzy controllers Genetic algorithm: concepts, coding, reproduction, crossover, mutation, scaling and fitness.

Text/References :

1. Elaine Rich and Kevin Knight, Artificial Intelligence, TMH Pub.
2. James A Anderson, An introduction to Neural Networks.
3. Dan. W Patterson, Artificial Intelligence and Expert Systems.

EE 704 UTILIZATION OF ELECTRICAL POWER

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **(i)Electric Heating:** Different methods of electric heating. Principle of high frequency induction and di-electric heating. Construction, operation, performance and applications of arc furnace and induction furnace. **(ii) Electric Welding:** Welding process, welding transformer, Classification of Electric Welding: arc welding, resistance welding, welding of various metals.
Unit-2 **Illuminations:** Definitions, laws of illuminations, polar curves, luminous efficiency, photometer, incandescent lamps: filament materials, halogen lamp. electric discharge lamps: sodium vapour lamp mercury vapour lamp and fluorescent lamp. **Light Calculations:** commercial, industrial, street and flood lighting.
Unit-3 **Electrolytic Process:** Principles and applications of electrolysis, electro-deposition, manufactures of chemicals, anodizing, electro polishing electro-cleaning, electroextraction, electrorefinig, electro-stripping (parting) power supplies for electrolytic process.
Unit-4 **Electric Traction & Means of Supplying Power:** Systems of Electric Traction: DC & AC Systems, Power Supply for Electric Traction System: Comparison and application of different systems. Sub-station equipment and layout, conductor rail & pantograph.
Unit-5 **Traction Methods:** Types of services, speed time and speed distance curves, estimation of power and energy requirements, Mechanics of train movement. Co-efficient of adhesion, Adhesive weight, effective weight. **Traction Motor Controls:** DC and AC traction motors, Series parallel starting. Methods of electric braking of traction motors.

Text/References :

1. H Pratap-Art & Science of Utilization of Electric
2. H. Pratap-Modern Electric Traction.

3. C.L. Wadhwa-Utilization of electric traction electric power.
4. G.K. Dubey-Electric Drives.
5. Vedam and Subrahmanyam-Concept & Application of Electric Drives.

EE 705 POWER SYSTEM ENGINEERING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Economic Operation of Power Systems:** Introduction, system constraints, optimal operation of power systems. Input output, heat rate and incremental rate curves of thermal generating units. Economic distribution of load between generating units within a plant. Economic distribution of load between power stations, transmission loss equation. Introduction to unit commitment and dynamic programming.
Unit-2 **Power System Stability -I:** Power angle equations and power angle curves under steady state and transient conditions. Rotor dynamics and swing equation (solution of swing equation not included), synchronizing power coefficient. Introduction to steady state and dynamic stabilities, steady state stability limit.
Unit-3 **Power System Stability-II:** Introduction to transient stability. Equal area criterion and its application to transient stability studies under basic disturbances, critical clearing angle and critical clearing time. Factors affecting stability and methods to improve stability.
Unit-4 **(i) Excitation Systems:** Introduction of excitation systems of synchronous machines, types of excitation systems, Elements of various excitation systems and their control (functional block diagrams and their brief description)-DC excitation systems, AC excitation systems, brushless excitation system. **(ii) Interconnected Power Systems:** Introduction to isolated and interconnected powers systems. Reserve capacity of power stations, spinning and maintenance resaves. Advantages and problems of interconnected power systems. Power systems inter connection in India.
Unit-5 (i) Tap Changing transformer, phase angle control and phase shifting transformer. Series compensation of transmission lines, location and protection of series capacitors, advantages and problems. (ii) Introduction to power system security. (iii) Introduction to voltage stability.

Text/References :

1. I.J. Nagrath and D.P. Kothari:Power system engineering.
2. J.J. Grainger and W.D. Stevenson:Power system Analysis.
3. B.R. Gupta:Generation of electrical energy
4. C.L. Wadhwa:Electrical power systems 5. C.M. Aroa:Power system Engineering

EE 706 ELECTROMAGNETIC FIELD THEORY

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Introduction:** Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system. Concept and physical interpretation of gradient, Divergence and curl, Green's Stoke's and Helmholz theorems.

Unit-2 **Electrostatics:** Electric field vectors-electric field intensity, flux density & polarization. Electric field due to various charge configurations. The potential functions and displacement vector. Gauss's law. Poisson's and Laplace's equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy. Field determination by method of images. Boundary conditions. Field mappings and concept of field cells.

Unit-3 **Magnetostatics:** Magnetic field vector: Magnetic field intensity, flux density & magnetization, Bio-Savart's law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance, Energy stored in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field mapping and concept of field cells.

Unit-4 **Time Varying Fields:** Faraday's law, Displacement currents and equation of continuity. Maxwell's equations, Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflections, refraction & polarization of UPW, standing wave ratio. Pointing vector and power considerations.

Unit-5 **Transmission Lines:** The high-frequency circuit. LCR ladder model. The transmission line equation. Solution for loss-less lines. Wave velocity and wave impedance. Reflection and Transmission coefficients at junctions. VSWR.

Text/References :

1. David K Cheng-Field and Vave Electromagnetic 2nd Ed. Wesley Publishing company.
2. Griffith-Introduction to Electrodynamics. 2nd Ed., Prentice Hall of India.
3. J D Kraus, Electromagnetic. 5th, Mc Graw Hill Book company.
4. P Lorrain, D R Corson-Electromagnetic field and waves. Willey Eastern Ltd.
5. V.V. Sarwate-Electromagnetic field and waves,willey estern Ltd.
6. T.he Feynman Lectures on physics, Vol-II Narosa Publishing House.
7. J.K. Kraus-Applied Electromagnetic, 5th Ed.

EE 707 DBMS LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1 Designing database and constraints using DDL statements.
2 Experiments for practicing SQL query execution on designed database.
3 Database connectivity using JDBC/ODBC.
4 Features of embedded SQL.
5 Designing front end in HLL and accessing data from backend database.
6 Designing simple projects using front end-back end programming.
7 Project for generating Electricity Bills
8 Project for managing student's attendance/marks details.

EE 708 POWER SYSTEM MODELLING & SIMULATION LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1 Simulate Swing Equation in Simulink (MATLAB)
2 Modelling of Synchronous Machine.
3 Modelling of Induction Machine.
4 Simulate simple circuits using Circuit Maker.
5 (a) Modelling of Synchronous Machine with PSS (b) Simulation of Synchronous Machine with FACTS device.
6 (a) Modelling of Synchronous Machine with FACTS device (b) Simulation of Synchronous Machine with FACTS devices.
7 FACTS Controller designs with FACT devices for SMIB system.

EE 709 INDUSTRIAL ECONOMICS & MANAGEMENT

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1 **Money Banking and Trade:** Functions of money, supply & demand for money, money price level & inflation, black money, meaning, magnitude & consequences. Functions of Commercial banks, banking system in India, shortcomings and improvements.. Function of RBI, monetary policy-making, objectives and features. Sources of public revenue, principles of taxation, direct and indirect taxes, Theory of international trade, balance of trade and
payment, Foreign exchange control, devaluation New economic policy: Liberalization, extending privatization, globalization.
2 **Management Principles:** Management functions, responsibilities of management to society, development of management thought. Nature of planning, decision making, management by objectives, Line and staff authority relationships, decentralization and delegation of authority, span of management,
3 **Production Management:** Production planning and control, inventory control, quality control and Total quality management. Tools of project management - CPM, PERT, project information systems. Marketing functions, management of sales and advertising marketing research.
4 **Human Resource Management:** Function, application of industrial psychology for selection, training and recruitment. Communication process, media channels and barriers to effective communication, theories of motivation, leadership.
5 **Finance and Account Management: Engineering Economics:** Investment decision, present worth, annual worth and rate of return methods. Payback time. Need for good cost accounting system, cost control techniques of financial control, financial statements, financial ratios, break-even analysis, budgeting and budgetary control.

B. E. VIII- SEMESTER
EE 801 EHV AC/DC TRANSMISSION

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **EHV AC Transmission:** Need of EHV transmission lines, power handling capacity and surge impedance loading. Problems of EHV transmission, bundled conductors: geometric mean radius of bundle, properties of bundle conductors. Electrostatic fields of EHV lines and their effects, corona effects: Corona loss, audio and radio noise.

Unit-2 **Load Frequency Control:** Introduction to control of active and reactive power flow, turbine speed governing system. Speed governing characteristic of generating unit and load sharing between parallel operating generators. **Method of Load Frequency Control:** Flat frequency, flat tie line and tie line load bias control. Automatic generation control (description of block diagram only).

Unit-3 **Voltage Control:** No load receiving end voltage and reactive power generation. Methods of voltage control. Synchronous phase modifier, shunt capacitors and reactors, saturable reactors, Thynstorised static VAR compensators- TCR, FC-TCR and TSC- TCR.

Unit-4 **FACTS:** Introduction to FACTS controllers, types of FACTS controllers, Brief description of STATCOM, Thyristor controlled series capacitors and unified power flow controller.

Unit-5 **HVDC Transmission:** Types of D.C. links, advantages and disadvantages of HVDC transmission. Basic scheme and equipment of converter station. Ground return. Basic principles of DC link control and basic converter control characteristics. Application of HVDC transmission.

Text/References :

1. R.D. Begamudre-EHV AC Transmission Engineering.
2. K.R. Padiyar-HVDC Power Transmission System
3. J.J. Grainger and W.D. Stevenson-Power system analysis.
4. B.R. Gupta-Generation of Electrical Engineering.
5. K.R. Padiyar-Flexible AC transmission systems-A status review, summer school on "Recent Advances in power electronics", August 10-21, 1988, IISc Bangalore, Page 10.1 to 10.16

EE 802 ELECTRIC DRIVES AND THEIR CONTROL

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **Dynamics of Electric Drives:** Fundamental torque equations, speed-torque conventions and multiquardant operation, equivalent values of drive parameters, nature and classification of load torques, steady state stability, load equalization, close loop configurations of drives.

Unit-2 **DC Drives:** Speed torque curves, torque and power limitation in armature voltage and field control, Starting, **Braking-** Regenerative Braking, dynamic braking and plugging. **Speed Control-** Controlled Rectifier fed DC drives, Chopper Controlled DC drives.

Unit-3 **Induction Motor Drives-I:** Starting, **Braking-** Regenerative braking, plugging and dynamic braking. **Speed Control-** Stator voltage control, variable frequency control from voltage source, Voltage Source Inverter (VSI) Control.

Unit-4 **Induction Motor Drives-II:** Variable frequency control from current source, Current Source Inverter (CSI) Control, Cycloconverter Control, Static rotor resistance control, Slip Power Recovery- Stator Scherbius drive, Static Kramer drive.

Unit-5 **Synchronous Motor Drive** : Control of Synchronous Motor-Separately Controlled and VSI fed Self-Controlled Synchronous Motor Drives. Dynamic and Regenerative Braking of Synchronous Motor with VSI. Control of Synchronous Motor Using Current Source Inverter (CSI)

Text/References :

1. G K Dubey Fundamentals of Electrical Drives,Narosa Publishing House, New Delhi,1995.
2. V Subrahmanyam:Thyristor control of electric Drives,Tata McGraw Hill, New Delhi, 1988.
3. V Subrahmanyam:Electric Drives-Concepts and Applications,Tata McGraw Hill,New Delhi.
4. S K Pillai:A first course on electrical Drives,Wiley Eastern limited,India.
5. B K Bose:Power electronics and A. C. Drives,Prentice Hall.

EE 803 SWITCHGEAR & PROTECTION

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 **(i) Static Relays:** Introduction to static relays, merits and demerits. **Comparators:** amplitude and phase comparators, duality between amplitude and phase comparators. Introduction to (a) amplitude comparators-circulating current type, phase splitting type and sampling type, (b) phase comparators-vector product type and coincidence type.
(ii) Static over Current Relays: Introduction to instantaneous, definite time, inverse time and directional overcurrent relays.
Unit-2 **(i) Static Differential Relays:** Brief description of static differential relay schemes-single phase and three phase schemes. Introduction to static differential protection of generator and transformer.
(ii) Static Distance Relays: Introduction to static impedance, reactance and mho relays.
Unit-3 **(i) Carrier Current Protection:** Basic apparatus and scheme of power line carrier system. Principle of operation of directional comparison and phase comparison carrier protection and carrier assisted distance protection.
(ii) Distance Protection: Effect of power swings on the performance of distance protection. Out of step tripping and blocking relays, mho relay with blinders. Introduction to quadrilateral and elliptical relays.
Unit-4 **Circuit Breakers I:** Electric arc and its characteristics, arc interruption-high resistance interruption and current zero interruption. Arc interruption theories–recovery rate theory and energy balance theory. Restriking voltage and recovery voltage, develop expressions for restriking voltage and RRRV. Resistance switching, current chopping and interruption of capacitive current. Oil circuit breakers-bulk oil and minimum oil circuit breakers. Air circuit breakers.
Unit-5 **(i) Circuit Breakers II:** Air blast, SF and vacuum circuit breakers. Selection of circuit breakers, rating of circuit breakers. **(ii) Digital Protection:** Introduction to digital protection. Brief description of block diagram of digital relay. Introduction to digital overcurrent, transformer differential and transmission line distance protection.

Text/References :

1. M Chander:Switchgear protection
2. S S Rao:Switchgear & protection
3. T M S Rao:Static Relays

EE 804 NON-CONVENTIONAL ENERGY SOURCES

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit-1 (i) Introduction: World energy situation, conventional and non-conventional energy sources, Indian energy scene. (ii) Tidal Energy: Introduction to tidal power. Components of tidal power plants, double basin arrangement. Power generation. Advantages and limitations of tidal power generation. Prospects of tidal energy in India.

Unit-2 **Solar Energy:** Solar radiation, solar radiation geometry, solar radiation on tilted surface. Solar energy collector. Flat- plate collector, concentrating collector – parabolidal and heliostat. Solar pond. Basic solar power plant. Solar cell, solar cell array, basic photo-voltaic power generating system.

Unit-3 **(i) Wind Energy:** Basic principle of wind energy conversion, efficiency of conversion, site selection. Electric power generation-basic components, horizontal axis and vertical axis wind turbines, towers, generators, control and monitoring components. Basic electric generation schemes- constant speed constant frequency, variable speed constant frequency and variable speed variable frequency schemes. Applications of wind energy. **(ii) Geothermal Energy:** Geothermal fields, estimates of geothermal power. Basic geothermal steam power plant, binary fluid geothermal power plant and geothermal preheat hybrid power plant. Advantages and disadvantages of geothermal energy. Applications of geothermal energy. Geothermal energy in India.

Unit-4 **Nuclear Fusion Energy:** Introduction, nuclear fission and nuclear fusion. Requirements for nuclear fusion. Plasma confinement - magnetic confinement and inertial confinement. Basic Tokamak reactor, laser fusion reactor. Advantages of nuclear fusion. Fusion hybrid and cold fusion.

Unit-5 **Biomass Energy:** Introduction, biomass categories, bio-fuels. Introduction to biomass conversion technologies. Biogas generation, basic biogas plants-fixed dome type, floating gasholder type, Deen Bandhu biogas plant, Pragati design biogas plant. Utilization of bio gas. Energy plantation. Pyrolysis scheme. Alternative liquid fuels –ethanol and methanol. Ethanol production.

Text/References :

EE 805 COMPUTER BASED POWER SYSTEM LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1 Fault analysis (for 3 to 6 bus) and verify the results using MATLAB or any available software for the cases: (i) LG Fault (ii) LLG Fault (iii) LL Fault and (iv) 3-Phase Fault 2 Load flow analysis for a given system (for 3 to 6 bus) using (i) Gauss Seidal (ii) Newton Raphson (iii) Fast Decoupled Method and verify results using MATLAB or any available software
3 Study of voltage security analysis
4 Study of overload security analysis and obtain results for the given problem using MATLAB or any software.
5 Study of economic load dispatch problem with different methods.
6 Study of transient stability analysis using MATLAB/ETAP Software.

EE 806 ELECTRICAL DRIVES AND CONTROL LAB

(L: 0; T: 0; P=2) **Max.Marks:150**
Min.Marks:75

1 Study and test the firing circuit of three phase half controlled bridge converter.
2 Study and obtain waveforms of 3 phase half controlled bridge converter with R and RL loads.
3 Study and test the firing circuit of 3-phase full controlled bridge converter.
4 Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL loads.
5 Study and test 3-phase AC voltage regulator.
6 Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature voltage versus speed characteristic.