Academic Regulations, Course Structure and Syllabus

B. TECH.
Electrical and Electronics Engineering
(4 Year Program)

NARASARAOPETA
ENGINEERING COLLEGE
(Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.
Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada. Code: 47.
Accredited by NBA & NAAC with "A" Grade; ISO 9001:2008 Certified Institution.
Phone: 08647239905 Website: www.nrtec.ac.in

ACADEMIC REGULATIONS - 2016 FOR B.TECH. (REGULAR)

(Applicable for the students of B.Tech. from the Academic Year 2016-17)

1. Eligibility for Admission

The total seats available as per the approved intake are grouped into two categories viz. category A and Category B with a ratio of 70:30 as per the state government guidelines vide G.O No.52

a. The admissions for category A and B seats shall be as per the guidelines of Andhra Pradesh State Council for Higher Education (APSCHE) in consonance with government reservation policy.

- ❖ Under Category A: 70% of the seats are filled through EAMCET counseling.
- ❖ Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE

b. Admission eligibility-Under Lateral Entry Scheme

Students with diploma qualification have an option of direct admission into 2nd year B. Tech. (Lateral Entry scheme). Under this scheme, 20% seats of sanctioned intake will be available in each course as supernumerary seats. Admissions to this three year B Tech later entry Programme will be through ECET. The maximum period to complete B. Tech. under Lateral Entry scheme is six consecutive academic years from the date of joining.

The selection for category A & B seats shall be as per Govt. of Andhra Pradesh rules.

2. AWARD OF B.TECH. DEGREE

A student will be declared eligible for the award of the B.Tech. Degree if he fulfills the following academic requirements.

(a) Pursue a course of study for not less than four academic years and not more than eight academic years counted from the academic year of admission.
(b) The student registers for 180 credits and secures all the 180 credits.

3. U.G.-B.TECH. PROGRAMS

The following UG- B.Tech. Programs are offered at present

S. No.	Branch Code-Abbreviation	Branch
01	01-CE	Civil Engineering
02	02-EEE	Electrical and Electronics Engineering
03	03-ME	Mechanical Engineering
04	04-ECE	Electronics and Communication Engineering
05	05-CSE	Computer Science and Engineering

And any other Program as approved by the authorities from time to time.

4. STRUCTURE OF THE PROGRAM

Program comprises of 4 academic years and each year has 2 semesters.

Each course is normally assigned a certain number of credits as follows:

- 3 credits for 3 lecture periods and 1 tutorial per week.
- 3 credits for 4 lecture periods per week
- 2 credits for 3 laboratory periods per week.
- 3 credits for 1 lecture and 4 practice periods for drawing subjects per week.
- 1 or 2 credits for Mini Project.
- 3 credits for Practical Training/ Internship.
- 10 credits for Project Work.

5. DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks for Theory, Practical Training / Internship and 75 marks for Practical's / Mini Project. The Project Work shall be evaluated for 200 marks.

5.1 THEORY

For all theory subjects consisting of 6 units in each subject, the assessment shall be for 40 marks through internal evaluation and 60 marks through external end semester examination of 3 hours duration.

5. 1a. INTERNAL EVALUATION

The internal evaluation will be based on two cycle tests conducted in each semester. The 40 internal marks will be awarded as sum of 75% of the best cycle and 25% of the least cycle examinations, where each cycle of examination contain

Descriptive test	- 20 Marks
Objective test	- 10 Marks
Assignment test	- 10 Marks

Each descriptive test question paper contains 3 questions one from each unit covering syllabus from 3 units (first 3 units for first cycle and remaining 3 units for second cycle). The student has to answer all the 3 questions (3X10M=30M). The 30 marks will be scaled down to 20 marks. The descriptive examination will be conducted for 1½ hour duration.

Online Objective type test question paper shall contain 20 objective questions for 10 marks covering syllabus from 3 units, which are considered for descriptive type test (20 X 1/2 M = 10M). The Objective Examination will be conducted for 20 minutes duration along with descriptive test.

In Assignment Tests, 5 or 6 questions will be declared in the class room at least one week in advance. In the test, one question will be given at random to each student and the student has to answer it.

The Assignment Test-1 will be conducted for 10 marks covering the syllabus of 1^{st}unit. The Assignment Test-2 will be conducted for 10 marks covering the syllabus of 2^{nd}unit. The internal marks for Assignment Test (10Marks) for cycle-I shall be computed as best of two Assignment Tests-1 & 2 conducted. The Assignment Test-3 will be conducted for 10 marks covering the syllabus of 4^{th} unit. The Assignment Test-4 will be conducted for 10 marks covering the syllabus of 5^{th} unit. The internal marks for Assignment Test (10 Marks) for cycle-II shall be computed as best of two Assignment Tests-3 & 4 conducted.

5.1 b. EXTERNAL EVALUATION

The question paper comprises of two parts i.e. Part-A and Part-B. Part-A is compulsory

and consists of six 2 marks questions covering all units. Part A is total 12 marks. Part-B consists of 6 questions, one from each unit and the student has to answer any four questions, and each question carries 12 marks. The examination duration is 3 hours.

5.2 PRACTICALS

For practical subjects there shall be continuous evaluation during the semester.

5.2. a. INTERNAL EVALUATION

There shall be continuous evaluation during the semester for25 internal marks.
The internal marks shall be awarded as follows:

Record	- 10 Marks
Internal Lab Test	- 10 Marks
Day to day performance	- 5 Marks

5.2. b. EXTERNAL EVALUATION

For practical subjects there shall be an external examination at the end of the semester for 50 marks in the presence of external examiner. The examination duration is 3 hours.

5.3 DRAWING SUBJECTS

a. For the subject having design or drawing (such as Engineering Graphics, Engineering Drawing, Machine Drawing etc.,), the distribution shall be 40 marks for Internal Evaluation and 60 marks for End Examination.
The 40 internal marks will be evaluated as follows:

Internal Tests	- 20 marks. (1½ hour duration)
Day to day work	- 20 marks (evaluation of drawing sheets)

In the internal test, 3 questions will be given to the student and he has to answer all the three questions (3x10M = 30M scaled down to 20 marks)

There shall be two internal tests in a semester. The sum of 75% of the best and 25% of the least of two internal tests shall be considered for the award of internal marks.

b. The syllabus for the subject "**Machine drawing using Auto CAD**" consists of two major portions:

1. Unit I to III –Conventional drawing pattern.
2. Unit IV to VI-Computer lab pattern using any drafting package

The distribution of internal and external marks is 40 and 60 marks respectively.

Internal Evaluation: Max Marks: 40
The total internal evaluation marks are distributed in the following two components:

1. Day-to-day work : 20 Marks (Evaluation of Charts)
2. Descriptive Test : 20 Marks

Cycle–I Examination – Conventional drawing pattern
In Cycle-I examination the 40 marks will be awarded as follows:

Day-to-day evaluation - 20 Marks
Descriptive Test - 20 Marks

In the Descriptive Test of duration 2 hours, 3 questions will be given to the student and he has to answer all the three questions (3x10M = 30M scaled down to 20 marks).
Cycle–II Examination – Computer lab pattern using any drafting package for

duration of 2 hours.
In Cycle-II examination the 40 marks will be awarded as follows:

Record	-10 Marks
Execution	-15 Marks
Paper Work	-15 Marks

Of two cycle examinations conducted during the semester, sum of 75% of the best and 25% of the least of two cycle examinations shall be considered for the award of internal marks.

End semester Examination (Total Duration: 4 hours, Max. Marks: 60)
Conventional drawing pattern (Duration: 2 Hours, Marks: 30)
Computer lab pattern using any drafting packages (Duration: 2 Hours, Max: 30)
(Note: Both Conventional drawing pattern and Computer lab pattern using any drafting packages are compulsory and are to be conducted in separate sessions)

5.4 MANDATORY NON-CREDIT COURSES

A student is required to take up Non-Credit/mandatory courses, viz. Advanced Communication Skills, Quantitative Aptitude, Verbal Ability, Reasoning, NSS / Sports & Games and MOOCs (Massive Open Online Courses) etc., as and when the courses are offered. The B.Tech degree shall only be awarded if a student gets satisfactory grade in each of the mandatory non-credit courses besides acquiring 180 credits.
A student has to repeat the course if he does not get satisfactory grade in each non- credit Course for getting the degree awarded.

NSS
There shall be internal valuation for 100 Marks, out of which 60 marks are for participation and involvement in day-to-day activities and 40 marks for participation and involvement in a three days NSS camp arranged during the semester.
Sports and Games
There shall be two internal valuations, each for 50 marks, in the chosen activity, one in the middle of semester and the other towards the end of the semester. Sum of the two valuations shall be taken as the final marks for 100.

MOOCs: Meeting with the global requirements, to inculcate the habit of self-learning and in compliance with UGC guidelines, MOOCs (Massive Open Online Courses) have been introduced. Student has to complete an on-line course to fulfill the academic requirement of B.Tech course. The on-line Course should be offered by any reputed organization like NPTEL, COURSERA, edX, Udacity, SWAYAM etc., approved by the departmental Committee constituted by HOD. Student has to submit the progress of the MOOC's course (such as assignment submission etc.,) to the departmental committee. B.Tech. degree shall be awarded only upon submission of MOOC's certificate. If a student fails to submit in that semester, he/she has to submit the certificate in the subsequent semesters for getting the degree awarded.

5.5. PRACTICAL TRAINING / INTERNSHIP

Students are advised to take up Industrial Internship. In case, the student is unable to Obtain the internship; they can opt for Practical Training.
Assessment for Internship:
Industrial Internship which is a part of the curriculum shall carry 100 marks. The time duration for internship shall be of 2 to 4 weeks during the inter semester break. After the completion of internship the student shall submit a certificate and a report to the concerned

departmental committee constituted by the HOD for Evaluation and to conduct a Viva-Voce Examination. Out of 100 marks, 40 marks shall be awarded for submission of certificate and report and 60 marks for presentation and Viva-Voce examination.

Assessment for Practical Training:

The practical training gained by student shall be assessed for 100 marks. The time duration for Practical Training shall be 2 to 4 weeks during the inter semester break. The training shall be evaluated through continuous assessment. After the completion of Practical Training the student shall submit a report to the Departmental Committee constituted by HOD for evaluation and to conduct a Viva-Voce Examination. Out of 100 marks 40 marks shall be awarded for day to day performance and submission of report and 60 marks for presentation and Viva-Voce examination.

5.6 MINI PROJECT

Mini Project shall be evaluated for a total of 75 marks. Out of a total of 75 marks, 25 marks shall be for internal evaluation consisting of day-to-day work, reviews, the assessment of the project report and 50 marks for the external evaluation. The external evaluation shall be conducted by the committee. The committee consists of an External Examiner, Head of the Department and Supervisor of the Project. The evaluation of mini project work shall be conducted as and when offered.

5.7 PROJECT WORK

Out of a total of 200 marks for the project work, 80 marks shall be for Internal Evaluation consisting of day-to-day work, reviews, the assessment of the project report and 120 marks for the external evaluation. The external evaluation shall be conducted by the committee. The committee consists of an External Examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year II semester.

6. PASS MARK CRITERIA

A student shall be deemed to have satisfied the pass mark, if he secures not less than 35% of marks in the end examinations and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together as detailed below.

On passing a course of a program, the student shall earn the credits as assigned to that course.

S. No.	Category of Subject	Max. Marks	Internal Marks	External Marks	External pass %	External pass mark	Over all pass %	Over all pass mark
1	Theory/Drawing/ Practical Training/ Internship	100	40	60	35	21	40	40
2	Practical	75	25	50	35	18	40	30
3	Mini Project	75	25	50	35	18	40	30
4	Project work	200	80	120	35	42	40	80

7. PROMOTION POLICY

7.1. ATTENDANCE REQUIREMENTS

(1) A student shall be eligible to appear for the end examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

(2) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester for genuine medical reasons and shall be approved by a committee duly appointed by the college. A fee stipulated by the college shall be payable towards Condonation of shortage of attendance. However the number of condonations is restricted to four for the entire course.

(3) A student who is short of attendance in a semester may seek re-admission into that semester when offered next time within 4 weeks from the date of commencement of class work.

(4) If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for re-admission into the same semester.

7.2. CREDIT REQUIREMENTS

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned above.

(1) A student shall be promoted from I to II year, if he put up the minimum attendance requirement in I year II semester, irrespective of credits earned.

(2) A student shall be promoted from II year to III year, only if he fulfills the academic requirement of 50% of the credits up to II year II semester from all the examinations, irrespective of whether the candidate takes the examination or not.

(3) A student shall be promoted from III to IV year, only if he fulfills the academic requirements of 50% of the credits up to III year II semester from all the examinations, irrespective of whether the candidate takes the examination or not.

(4) A candidate, who is not promoted either to III year or IV year due to lack of required credits can seek admission into III / IV year in subsequent years after obtaining the required credits as stipulated above.

(5) A student shall register and put up minimum attendance in all 180 credits and earn all 180 credits. Marks obtained in the all 180 credits shall be considered for the calculation of grade points/division.

(6) The registrations in audit courses/ mandatory courses i.e. Advanced Communication skills, Aptitude, Verbal Ability, Quantitative Aptitude and Reasoning, NSS / Sports & Games and MOOCs etc., is compulsory and student should get a satisfactory report.

8. COURSE PATTERN

(1) The entire course of study is of four academic years and each year will have TWO Semesters (Total EIGHT Semesters).

(2) Supplementary Examinations:

A student is eligible to appear for the end examination in a subject, but absent for it or has failed in the end examinations may appear for that subject in supplementary examinations, when conducted next.

(3) Advanced supplementary Examinations:

Students who failed in courses of 4thB.Tech. 2ndSemester can appear for advanced

supplementary examination conducted within one month after declaration of the revaluation results. However, those students who failed in these advanced supplementary examinations shall appear for subsequent examinations along with regular candidates in the examinations conducted at the end of the respective semester.

(4) When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted in to the same semester / year in which he has been detained.

9. METHOD FOR AWARDING OF GRADE POINTS FOR A SUBJECT

Theory/ Drawing / Laboratory / Practical Training / Internship / Mini Project / Project (% of marks in a subject)	Corresponding Grade Points	Letter Grade
91 - 100	10	O (Outstanding)
81 - 90	9	E(Excellent)
71 - 80	8	A (Very Good)
61 - 70	7	B (Good)
51 - 60	6	C (Satisfactory)
40 - 50	5	P(Pass)
<40	0	F (Fail)

10. CRITERIA FOR AWARD OF GRADES/DIVISION

10.1 Calculation of Semester Grade Point Average (SGPA)* for semester

The performance of each student at the end of each semester is indicated in terms of SGPA. The SGPA is calculated as given below:

$$SGPA = \frac{\sum(CR \times GP)}{\sum CR}$$

Where CR = Credits of a subject
GP = Grade Points awarded for a subject

*SGPA is calculated for a student who passed all the subjects in that semester.

10.2 Calculation of Cumulative Grade Point Average (CGPA)* for Entire Program

The CGPA is calculated as given below:

$$CGPA = \frac{\sum(CR \times GP)}{\sum CR}$$

Where CR= Credits of a subject
GP = Grade Points awarded for a subject

*CGPA is calculated for a student who passed all the subjects in previous semesters along with current semester.

- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

- Equivalent percentage = (CGPA – 0.75) x 10

10.3 Award of Division

After satisfying the requirements prescribed for the completion of the program, the student shall be eligible for the award of B.Tech Degree and shall be placed in one of the following classes:

CGPA	Class
≥ 7.75	Degree with First Class with Distinction (with no subject failures)
≥ 6.75	Degree with First Class (with subject failures)
≥ 5.75 &< 6.75	Degree with Second Class
< 5.75	Degree with Pass Class

10.4 CONSOLIDATED GRADE MEMO

All the students who registered for the semester end examinations will be issued Memorandum of marks by the Institute. A Consolidated Grade Memo containing credits and grades obtained by the student will be issued after completion of the four year B.Tech program.

11. REVALUATION

1. Student can submit the application for revaluation, along with the prescribed fee for revaluation of his answer script(s) of theory subject(s) as per the notification issued by the Controller of Examinations.
2. The Controller of Examinations shall arrange for revaluation of such answer script(s).
3. An External examiner, other than the first examiner shall reevaluate the answer script(s).

12. MINIMUM INSTRUCTION DAYS

The minimum instruction days for each semester shall be 90 working days.

13. There shall be no branch transfer after the completion of admission process.

14. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the college or if any case of indiscipline is pending against him, the result of such student will be kept withheld. His degree will be withheld in such cases.

15. TRANSITORY REGULATIONS

Discontinued or detained candidates are eligible for readmission as and when next offered.
A candidate, who is detained or discontinued in a semester, on readmission shall be required to do all the subjects in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such subjects in the earlier semester(s) he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

15.1. A student who is following JNTUK curriculum and detained due to shortage of attendance at the end of the first semester of first year shall join the autonomous batch of first year first semester. Such students shall study all the subjects prescribed for the batch in which the student joins and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.

15.2. A student who is following JNTUK curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of first year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the subjects of the semester(s) of the batch which he had passed earlier and substitute subjects will be offered in place of them as decided by the Board of Studies. The student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree will be sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

15.3 Transfer candidates (from non-autonomous college affiliated to JNTUK)

A student who is following JNTUK curriculum, transferred from other college to this college in second year first semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the subjects of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of Studies. The student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

15.4 Transfer candidates (from an autonomous college affiliated to JNTUK)

A student who has secured the required credits up to previous semester as per the regulations of other autonomous institutions shall also be permitted to be transferred to this college.

A student who is transferred from the other autonomous colleges to this college in second year first semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree.

However, exemption will be given in the subjects of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of studies.

The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester as per the regulations of the college from which he has transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous stream. The class will be

awarded based on the academic performance of a student in the autonomous pattern.

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Academic Regulations (16) for B. Tech. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2017- 18 and onwards)

1. AWARD OF B. TECH. DEGREE

A student will be declared eligible for the award of the B. Tech. Degree if he fulfills the following academic regulations.

(a) Pursue a course of study for not less than three academic years and not more than six academic years counted from the academic year of admission.

(b) The candidate registers for 132credits and secures all the 132 credits.

2. The attendance regulations of B.Tech (Regular) shall be applicable to B.Tech (LES), whereas the number of condonations is restricted to 3.

3. PROMOTION RULE

(a) Attendance requirement is same as regular course.

(b) A lateral entry student will be promoted from II to III year if he puts up the minimum required attendance in II year II semester irrespective of credits earned.

(c) A student shall be promoted from III to IV year only if he fulfills the academic requirements of 50% of the credits up to III Year II semester from all the examinations, whether the candidate takes the examinations or not.

4. TRANSITORY REGULATIONS

4.1 A student who is following JNTUK curriculum and detained due to shortage of attendance at the end of the first semester of second year shall join the autonomous batch of second year first semester. Such students shall study all the subjects prescribed for the batch in which the student joins and considered on par with Lateral Entry regular candidates of Autonomous stream and will be governed by the autonomous regulations.

4.2 A student who is following JNTUK curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of second year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the subjects of the semester(s) of the batch of them as decided by the Board of Studies.

The student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

5. All the other regulations as applicable for B. Tech. Four- year degree course (Regular) will be applicable for B. Tech. (Lateral Entry Scheme).

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT INEXAMINATIONS

- The Principal shall refer the cases of Malpractices in Internal Assessment Test and Semester end examinations to a malpractice prevention committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the students based on the recommendations of the committee.
- Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder:

	Nature of Malpractices/ Improper conduct	**Punishment**
	If the candidate:	
1(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
1(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the college.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and to be allowed

		to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s)has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6to 8.	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not	

	covered in the above clauses 1 to 11 shall be reported to the college for further action to award suitable punishment.	

OTHER MATTERS:

1. Physically challenged candidates who have availed additional examination time and a scribe during their intermediate / EAMCET examinations will be given similar concessions on production of relevant proof / documents.
2. The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Heads of the departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the departments shall be reported to the Academic Council for ratification.

GENERAL:

1. The academic council may, from time to time, revise, amend or change the regulations, schemes of examinations and / or syllabi.
2. Where ever the words ‘’he’’ ‘’him’’ ‘’his’’, occur in the regulations, they include ‘’she’’, ’’her’’, ’’hers’’.
3. The academic regulation should be read as a whole for the purpose of any interpretation.
4. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.

B.TECH. FOUR YEAR DEGREE COURSE STRUCTURE

I B.TECH. - I SEMESTER

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Functional English	HS	4	-	-	40	60	100	3
2	Engineering Mathematics	BS	3	1	-	40	60	100	3
3	Professional Ethics Values and Patents	HS	4	-	-	40	60	100	3
4	Programming with C	ES	3	1	-	40	60	100	3
5	Engineering Chemistry	BS	3	1	-	40	60	100	3
6	Mathematical Methods	BS	3	1	-	40	60	100	3
7	Basic Communication Skills Lab	HS	-	-	3	25	50	75	2
8	Engineering Chemistry Lab	BS	-	-	3	25	50	75	2
9	Computer Programming Lab	ES	-	-	3	25	50	75	2
	Total		20	4	9	315	510	825	24

HS: Humanities and Social Sciences

ES: Engineering Sciences

BS: Basic Sciences

PC: Professional Course

PE: Professional Elective

OE: Open Elective

PW: Project Work

MC: Mandatory Course (No Credits)

L: Lecture

T: Tutorial

P: Practical

I B.TECH. - II SEMESTER

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Interactive English	HS	4	-	-	40	60	100	3
2	Engineering Physics	BS	3	1	-	40	60	100	3
3	Environmental Studies	HS	4	-	-	40	60	100	3
4	Engineering Graphics	ES	1	-	4	40	60	100	3
5	Integral Transformations and Vector Calculus	BS	3	1	-	40	60	100	3
6	Electrical Circuit Analysis-I	PC	3	1	-	40	60	100	3
7	Enhancing Communication Skills Lab	HS	-	-	3	25	50	75	2
8	Engineering Physics Lab	BS	-	-	3	25	50	75	2
9	Electrical and IT workshop lab	ES	-	-	3	25	50	75	2
	Total		18	3	13	315	510	825	24

II B.TECH. - I SEMESTER

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Electrical Circuit Analysis – II	PC	3	1	-	40	60	100	3
2	Electronic devices and Circuits	ES	3	1	-	40	60	100	3
3	Electro Magnetic Fields	PC	3	1	-	40	60	100	3
4	Fluid Mechanics and Prime Movers	ES	3	1	-	40	60	100	3
5	Complex Variables and Statistical Methods	BS	3	1	-	40	60	100	3
6	Electrical Machines-I	PC	3	1	-	40	60	100	3
7	Electrical Circuits Lab	PC	-	-	3	25	50	75	2
8	Electronic devices and Circuits Lab	ES	-	-	3	25	50	75	2
9	Verbal Ability	MC	3	-	-	-	-	-	-
	Total		21	6	6	290	460	750	22

II B.TECH. – II SEMESTER

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Digital Electronics	PC	3	1	-	40	60	100	3
2	Control Systems	PC	3	1	-	40	60	100	3
3	Power Generation and Economic Aspects	PC	3	1	-	40	60	100	3
4	Electrical Machines-II	PC	3	1	-	40	60	100	3
5	Business Management Concepts for Engineers	HS	3	1	-	40	60	100	3
6	Analog Electronics	PC	3	1	-	40	60	100	3
7	Electrical Machines - I Lab	PC	-	-	3	25	50	75	2
8	Analog & Digital Circuits Lab	PC	-	-	3	25	50	75	2
9	Quantitative Aptitude and Reasoning-I	MC	3	-	-	-	-	-	-
	Total		21	6	6	290	460	750	22

III B.TECH. - I SEMESTER

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Power System Transmission Lines	PC	3	1	-	40	60	100	3
2	Power Electronics	PC	3	1	-	40	60	100	3
3	Electrical Measurements	PC	3	1	-	40	60	100	3
4	Microprocessor & Microcontrollers	PC	3	1	-	40	60	100	3
5	Signals and Systems	PC	3	1	-	40	60	100	3
6	**Professional Elective - I** 1.Renewable Energy Sources 2.Electrical Machine Design 3. Micro Electro Mechanical Systems 4.Industrial Instrumentation	PE	3	1	-	40	60	100	3
7	Control Systems and Measurements Laboratory	PC	-	-	3	25	50	75	2
8	Electrical Machines - II Laboratory	PC	-	-	3	25	50	75	2
9	Mini Project – I	PW	-	-	-	25	50	75	1
10	Advanced Communication Skills	MC	2	-	-	-	-	-	-
11	Sports and Games	MC		-	3	-	-	-	-
	Total		20	6	9	315	510	825	23

III B.TECH. – II SEMESTER

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Power System Analysis	PC	3	1	-	40	60	100	3
2	Power Semiconductor Drives	PC	3	1	-	40	60	100	3
3	Data Structures	ES	3	1	-	40	60	100	3
4	**Professional Elective - II** 1. Electrical Distribution Systems 2.Energy Audit Conservation and Management 3.Digital Signal Processing 4.Special Machines	PE	3	1	-	40	60	100	3
5	Open Elective – I	OE	4		-	40	60	100	3
6	Power Electronics Lab	PC	-	-	3	25	50	75	2
7	Data Structures Lab	ES	-	-	3	25	50	75	2
8	Microprocessors and Microcontrollers Lab	PC	-	-	3	25	50	75	2
9	Quantitative Aptitude & Reasoning II	MC	3	-	-	-	-	-	-
	Total		19	4	9	275	450	725	21

IV B.TECH. - I SEMESTER

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Power System Operation and Control	PC	3	1	-	40	60	100	3
2	Switchgear and Protection	PC	3	1	-	40	60	100	3
3	Utilization of Electrical Energy	PC	3	1	-	40	60	100	3
4	Open Elective – II	OE	4	-		40	60	100	3
5	**Professional Elective - III** 1.Modern Control Systems 2.VLSI Design 3.Embedded Systems 4.Power Quality	PE	3	1	-	40	60	100	3
6	**Professional Elective - IV** 1.HVAC & DC Transmission 2.PLC and Automation 3.High Voltage Engineering 4.Optimization Techniques	PE	3	1	-	40	60	100	3
7	Power Systems and Simulation Lab	PC	-	-	3	25	50	75	2
8	Mini Project – II	PW	-	-	3	25	50	75	2
	Total		19	5	6	290	460	750	22

IV.TECH. - II SEMESTER

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Soft Computing Techniques to Electrical Engineering	PC	3	1	-	40	60	100	3
2	**Professional Elective – V** 1. FACTS 2.Power System Deregulation 3.SmartGrid 4.Switched Mode Power Converters	PE	3	1	-	40	60	100	3
3	Open Elective - III	OE	4	-	-	40	60	100	3
4	Practical Training / Internship	PW	-	-	-	40	60	100	3
5	Project Work	PW	-	-	-	80	120	200	10
	Total		10	2	-	240	360	600	22

LIST OF OPEN ELECTIVES

Open Elective – I	Department Offering the Subject	No.of periods per week		No.of Credits
Subject Title		**L**	**T**	
Elements of Mechanical Engineering (Other than ME)	ME	4	-	3
Material Science (Other than ME)	ME	4	-	3
Basic Electrical and Electronics Engineering (Other than EEE,ECE & ME)	EEE	4	-	3
Industrial Electronics (Other than EEE)	EEE	4	-	3
Principles of Signals, system & Communications (Other than ECE)	ECE	4	-	3
Automotive Electronics	ECE	4	-	3
Medical Electronics	ECE	4	-	3
Image Processing Algorithms and Analysis (Other than ECE)	ECE	4	-	3
Database Management Systems (Other than CSE & ECE)	CSE	4	-	3
Front End UI & Frame Work Tools (Other than CSE)	CSE	4	-	3
Principles of water quality management.	CE	4	-	3
Remote Sensing and GIS (other than CE).	CE	4	-	3

Open Elective – II	Department Offering the Subject	No.of periods per week		No.of Credits
Subject Title		**L**	**T**	
Nanotechnology	ME	4	-	3
Work Study	ME	4	-	3
Fundamentals of Electrical Energy(Other than EEE)	EEE	4	-	3
Linear Control Theory (Other than EEE & ECE)	EEE	4	-	3
Introduction to Microprocessors and Micro Controllers (Other than ECE & EEE)	ECE	4	-	3
Consumer Electronics	ECE	4	-	3
Internet of Things (IOT) (Other than CSE)	CSE	4	-	3
Web Technologies (Other than CSE)	CSE	4	-	3
Cloud Computing (Other than ECE)	CSE	4	-	3
OOPS through JAVA (Other than CSE & ECE)	CSE	4	-	3
Disaster Management	CE	4	-	3
Building Services (Other than CE).	CE	4	-	3

Open Elective – III	**Department Offering the Subject**	**No.of periods per week**		**No.of Credits**
Subject Title		**L**	**T**	
Operations Research (Other Than ME)	ME	4	-	3
Robotics	ME	4	-	3
Energy Audit, Conservation & Management (Other than EEE)	EEE	4	-	3
Non-Conventional Energy Resources (Other than EEE)	EEE	4	-	3
Introduction to embedded systems (Other than ECE)	ECE	4	-	3
Global Positioning System	ECE	4	-	3
Computer Networks (Other than CSE & ECE)	CSE	4	-	3
Web Animation and Interactivity Using Flash	CSE	4	-	3
Web Services	CSE	4	-	3
Water shed Management.	CE	4	-	3
Solid and Hazardous waste management (Other than CE).	CE	4	-	3

I B.TECH I SEMESTER

I B.TECH. - I SEMESTER COURSE STRUCTURE

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Functional English	HS	4	-	-	40	60	100	3
2	Engineering Mathematics	BS	3	1	-	40	60	100	3
3	Professional Ethics Values and Patents	HS	4	-	-	40	60	100	3
4	Programming with C	ES	3	1	-	40	60	100	3
5	Engineering Chemistry	BS	3	1	-	40	60	100	3
6	Mathematical Methods	BS	3	1	-	40	60	100	3
7	Basic Communication Skills Lab	HS	-	-	3	25	50	75	2
8	Engineering Chemistry Lab	BS	-	-	3	25	50	75	2
9	Computer Programming Lab	ES	-	-	3	25	50	75	2
	Total		20	4	9	315	510	825	24

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MC: Mandatory Course (No Credits)

L: Lecture

T: Tutorial

P: Practical

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
FUNCTIONAL ENGLISH (Common to All Branches)							

Course Objectives:

- To enable the engineering students develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To integrate English Language learning with employability skills and training.
- To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course

Course Outcomes:

Learners are able to

- Speak clearly, effortlessly, confidently and appropriately.
- Write coherently with acceptable accuracy, organizing ideas logically.
- Listen and read to comprehend different discourses and different genres of texts.
- The learner will be able to read and infer, analyze, predict, interpret and draw conclusions any printed text.

Teaching Methodology:

The methodology of teaching will be chalk and talk, PPT, audio-visual and activity based

UNIT-I:

Hours of Instruction per unit: 8

HUMOUR: An Astrologer's Day

Objective: To criticize the superstitious beliefs of the people in the contemporary society. To make the learners understand that an astrologer is not trustworthy as he deceives the people by bewitching them in order to get some money. So we should not believe anyone by means of outward appearance.

Outcome: To students will develop rational thinking instead of believing blindly everything without reason.

a. Vocabulary : Prefixes, Suffixes

(www.englishhints.com,

www.enchantedlearning.com,

www.learnenglish.de/grammar/prefixtext.html)

b. Grammar : Nouns, Pronouns, Articles

c. Writing : Sentences structures.

UNIT-II:

Hours of Instruction per unit: 8

INSPIRATION: Building a New State

Objective: To make the students know the value of natural resources that are abundantly available in our country.

Outcome: Learner will understand the importance of the natural resources that are valuable in nature in order to develop our nation.

a. Vocabulary : Homophones, Homographs, Homonyms Synonyms & Antonyms and Commonly confused words (http://www.magickeys.com/books/riddles/words.html)
b. Grammar : Finite verbs, Non-finite verbs & question tags
c. Listening : Main points & sub-points
d. Writing : Paragraphs, Note making, Expansion of Proverbs

UNIT-III

Hours of Instruction per unit: 8

SUSTAINABLE DEVELOPMENT: Water: The Elixir of Life

Objective: To inform the learner how precious the water is, as well as the advantages and the characteristics of water.

Outcome: The learner will understand that water is the elixir of life and it should not be wasted but should be utilized in a proper way.

a. Vocabulary : One Word Substitutes, (http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf)
b. Grammar : Tenses
c. Listening : Listening for the theme and gist
d. Writing : Official letters, Curricula vitae, Covering Letters

UNIT-IV

Hours of Instruction per unit: 8

RELATIONSHIPS: The Wood rose

Objective: To enlighten the learner the value of human relationships as we are social animals and the need to maintain good relationship with elders and senior citizens.

Outcome: The learner will come to know that the old people are not to be ignored but it is the duty of the children to consider the wishes, feelings, emotions, ideas and thoughts of the older generation.

a. Vocabulary : Phrasal verbs & idioms
b. Grammar : Subject verb agreement, Active and Passive voice, Prepositions
c. Listening : Listening for specific detail and information.
d. Writing : Official reports (Fundamentals of technical communication Pg.No. (119- 153)

UNIT-V

Hours of Instruction per unit: 8 SCIENCE AND HUMANISIM: Progress

Objective:

- To enable the learner grasp the negative aspect of scientific inventions which are responsible for the anti-social activities of the present day.

Outcome:

- Understand that Science and Technology is a double edged knife and must be used with discrimination

a. Vocabulary : Collocations, Technical vocabulary, common errors in vocabulary
b. Grammar : Conditional sentences, conjunctions, common errors in grammar
c. Listening : Listening for opinions and attitude.
d. Writing : Events and essays

UNIT-VI

Hours of Instruction per unit:
8 READING

Objectives:

- To understand types and sub-skills of reading and apply techniques to improve reading speed.

Outcomes:

- Demonstrate reading speed and comprehend the gist of passage.
- Intensive reading, Extensive reading, predicting the content, skimming, scanning, Inferring meanings: lexical and contextual.

Text Book:

1. Using English – Orient Black Swan Pvt.Ltd.Publishers

References Books:

1. Meenakshi raman, Sangeeta, Sharma *Fundamentals of technical communication*, Pg: 119-153 Oxford University Press, 2015
2. Rutherford, Andrea. J, *Basic Communication Skills for Technology.* Pearson, New Delhi. 2001
3. Raymond Murphy, *Murphy's English Grammar,* Cambridge University Press 2004
4. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: English Skills for Engineers*, Oxford University Press, 2009
5. Michael Swan, *Practical English Usage,* Oxford University Press, 1996

Online Sources:

1. www.englishhints.com, www.enchantedlearning.com,
2. www.learnenglish.de/grammar/prefixtext.html
3. http://www.magickeys.com/books/riddles/words.html.

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
ENGINEERING MATHEMATICS (Common to All Branches)							

Course Objectives:

- The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course
- The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes:

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

- Solve ordinary differential equations of first, second and higher order.
- Learn basic concept of partial differentiation.

UNIT- I: Ordinary Differential Equations

Linear equations of first order, Bernoulli differential equation, exact equations, equations reducible to exact equations. Newton's Law of cooling, natural growth and decay, orthogonal trajectories.

UNIT-II: Linear Differential Equations Of Higher Order

Definitions, Operator D, Rules for finding the complementary functions, Inverse operator, Rules for finding the particular integrals, Method of variation of parameters, Equations reducible to linear equations with constant coefficients. R-L-C circuits, Simple Harmonic motion.

UNIT – III: Mean Value Theorems

Review on limits and continuity, Mean Value theorems (without proofs) Rolle's theorem, Lagrange's theorem, Cauchy's theorem, increasing and decreasing functions, Maxima and minima of function of single variable.

UNIT- IV: Partial Differentiation

Function of two or more variables, Partial derivatives, Total derivatives, change of variables, Jacobian - functional dependence, Tailor's for Two variables. Maxima and Minima of functions of two variables, Lagrange method of undetermined multipliers.

UNIT- V: First Order Partial Differential Equations

Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange's) equations.

UNIT- VI: Higher Order Partial Differential Equations

Solutions of Linear Partial differential equations with constant coefficients, Method of separations of Variables, One dimensional wave equation, One Heat equations.

Text Book:

1. Dr. B.S. Grewal "*Higher Engineering Mathematics*", 42nd Edition, Khanna Publishers, 2012.

Reference Books:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012
2. Keryszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
3. Ravish R Singh, Mukul Bhatt, "*Engineering Mathematics*" Fourth reprint, McGraw Hill Education Pvt., Lim.,
4. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
5. Peter V. O'Neil, *"Advanced Engineering Mathematics"*, 7th Edition, Cengage Learning, 2011.
6. Srimanta Pal and Suboth C. bhunia, *"Engineering Mathematics"*, oxford University Press, 2015.

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
PROFESSIONAL ETHICS, VALUES AND PATENTS (Common to All Branches)							

Course Objectives:

- To equip the student with the basic knowledge relating to the ethical behaviour in engineering discipline.
- To make the students understand the rules and regulation relating to intellectual property rights (Patents, copyrights, trademarks etc.,)

Course Outcomes:

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

- The outcome of this program is that the student learns necessary behavioral skills relating to the Ethics at industrial sector and to gain fundamental knowledge relating to IPR's

UNIT-I: Human Values

Ethics, Morals, Values, Integrity, Work Ethics- Service Learning – Civic Virtue- Respect for Others- Living Peacefully- Caring- Sharing- Honesty- Courage- Value Time- Cooperation- Commitment – Empathy- Self-Confidence- Spirituality- Character.

UNIT-II: Engineering Ethics

Professional roles to be played by Engineer- Engineers role as managers, consultants and Leaders- Ethical theories and its uses.

UNIT-III: Engineers Responsibilities and Rights

Professional Rights And Responsibilities, Whistle Blowing, Cross Cultural Issues And Occupational Crimes- Industrial Espionage.

UNIT-IV: Introduction to Intellectual Property Law

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

UNIT-V: Intellectual Property Rights

Basics, Types of Intellectual Property- Copy Rights – Principles- Subject Matter of Copy Rights- Copy Right Formalities and Registration- Patent Law – Rights and Limitations – Patent Requirements – Patent Registration Process.

UNIT-VI: Trademark

Trademark Registration Process- Post Registration Process – Transfer of Rights- Trade Secrets – Maintaining Trade Secrets- Physical Security- Employee Confidentiality Agreement- Cyber Law and Cybercrimes.

Text Book:

1. "Professional Ethics and Morals by Prof. A.R.Arasri, Dharanikota Suyodhana- Maruthi Publications.

Reference Books:

1. Deborah e. Bouchoux: “Intellectual property”. Cengage learning, New Delhi.
2. Kompal Bansal & Parishit Bansal” Fundamentals of IPR for Engineers BS Publications.
3. Cyber Law. Texts & Cases, South- western’s special topics collections.
4. M. Ashok kumar and mohd. Iqbal Ali: “Intellectual property right” serials pub.
5. “Engineering Ethics and Human Values” by M. Govindarajan, S. Natarajan and V.S. Senthil kumar- PHI Learning PVT. Ltd-2009

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
PROGRAMMING WITH C (Common to ECE,EEE,CIVIL and Mechanical)							

Course Objectives:

- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

Course Outcomes:

- Study and Understand basics of computer Hardware and Software.
- Study, Analyze and Understand logical structure of computer programming and different constructs to develop programs in C language.
- Understand and Analyze simple data structures and use of pointers and dynamic memory allocation technique.
- Create files and apply file I/O operations.

UNIT I:

INTRODUCTION: Computer systems, Hardware and Software Concepts**,**

Problem Solving: Algorithm / Pseudo code, flowchart, program development steps, computer languages: machine, symbolic and high-level languages, Creating and Running Programs: Writing, Editing (vi/emacs editor), Compiling (gcc), Linking and Executing in under Linux.

BASICS OF C: Structure of a C program, identifiers, basic data types and sizes. Constants, Variables, Arithmetic , relational and logical operators, increment and decrement operators, conditional operator, assignment operator, expressions, type conversions, Conditional Expressions, precedence and order of evaluation, Sample Programs.

UNIT II:

SELECTION – MAKING DECISION: TWO WAY SELECTION: if-else, null else, nested if, examples, Multi-way selection: switch, else-if, examples**.**

ITERATIVE: loops- while, do-while and for statements, break, continue, initialization and updating, event and counter controlled loops, Looping applications: Summation, powers, smallest and largest.

ARRAYS: Arrays- concepts, declaration, definition, accessing elements, storing elements, Strings and String Manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays, array applications: Matrix operations, checking the symmetricity of a Matrix**.**

STRINGS: concepts, c strings.

UNIT III:

FUNCTIONS- MODULAR PROGRAMMING: functions, basics, parameter passing, storage classes extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for fibonacci series, towers of Hanoi, header files, C Preprocessor, example c programs, Passing 1-D arrays, 2-D arrays to functions.

UNIT IV:

POINTERS: pointers- concepts, initialization of pointer variables, pointers and function arguments, passing by address- dangling memory, address arithmetic, character pointers and functions, pointers to pointers, pointers and multi-dimensional arrays, dynamic memory management functions, command line arguments

UNIT V:

ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, program applications

UNIT VI:

FILE HANDLING: Input and output- concept of a file, text files and binary files, Formatted I/O, File I/O operations, example programs

Text Books:

1. Programming in C, Reema Thareja, OXFORD.
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed..

Reference Books:

1. Programming in ANSI C, Dr.E.Balaguruswamy, Tata McGraw-Hill Education.
2. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PEARSON.
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.
4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
ENGINEERING CHEMISTRY (Common to All Branches)							

Course Objectives:

- For prospective engineers knowledge about water used in industries and for drinking purpose is useful; hence chemistry of hard water, boiler troubles and modern methods of softening hard water are introduced.
- Polymer chemistry may be one of the most relevant of the sub-disciplines of chemistry for the modern citizen. Very few consumer goods are made without a significant contribution from the spectacular applications of polymers. Modern materials depend on large variety of properties available from polymers. Not only is polymer chemistry eminently practical, it is also fascinating from an academic view point.
- With the increase in demand, a wild variety of materials coming up. Some of them have excellent engineering properties and a few of these materials are introduced.
- The basics for the construction of galvanic cells as well as some of the sensors used in instruments are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory.
- Fuels as a source of energy are a basic need in industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- Photochemistry is to understand the basic principles and types of photochemical reactions. To ensure that students have a good knowledge about photo energy. To be aware with the significant applications of photochemistry in many life areas.

Course Outcomes:

- Water Technology deals with the processes and mechanisms that are required to manage the human water cycle. Its function is to provide continuous and sufficient quantities of safe palatable drinking water for both domestic and industrial consumers and dispose of the used water to prevent environmental damage and to protect public health.
- The advantages and limitations of plastic materials and their use in design would be understood.
- The students would be now aware of materials like nanomaterial, fullerenes and their uses. Similarly liquid crystals, solar cells and cement are understood. The importance of green synthesis is well understood and how they are different form conventional methods is also explained.
- Able to apply operating principles and the reaction mechanisms of electrochemistry knowledge to analysis and design of batteries and fuel cells. Able to get knowledge on corrosion in order to protect the metals from the environment.
- To be able to understand and perform the various characterization techniques of fuels and fuels which are used commonly and their economics, advantages and limitations are discussed.
- To understand the basics of photochemistry, Law of absorption of light, limitation/deviation and applications of Lambert Beer's law, photochemical law, Jablonski's diagram, applications of photochemistry.

UNIT-I: Water and its Industrial Applications

Sources of water–Impurities of water–Hardness, types of hardness and its units–Estimation of hardness by EDTA method–Boiler troubles (Sludge and Scale, Priming and Foaming, Caustic embrittlement, Boiler corrosion)–Softening of water–Internal treatment methods– External treatment methods–(Lime–Soda, Zeolite and Ion exchange process)–Desalination of brackish water (Reverse osmosis and Electrodialysis)–Municipal water treatment methods–Problems on hardness and lime-soda process.

UNIT-II: Polymer Science and Technology

Introduction-Classification of polymers–Polymerization, types and mechanism of polymerization–Stereo regular polymers–Plastics–Thermoplastics and thermosetting plastics– Compounding of plastics–Preparation, properties and applications of Polyethylene, PVC, Bakelite and Polycarbonates–Rubbers and elastomers–Natural rubber, vulcanization– Synthetic rubbers (Buna–N, Buna–S, Thiokol rubber)–Applications–Fiber reinforced plastics, Conducting polymers and Biodegradable polymers.

UNIT-III: Chemistry of Advanced Materials

Nanomaterials **:** Types–Preparation of carbon nanotubes and fullerenes–Properties and engineering applications

Liquid crystals **:** Types and engineering applications

Green Chemistry **:** Principles–Methods for green synthesis and applications

Cement **:** Preparation of Portland cement–Setting and hardening of cement

Solar Cells **:** Solar heaters–Photovoltaic cells–Solar reflectors

UNIT-IV: Electrochemical Cells and Corrosion

Galvanic cells–Single electrode potential–Reference electrodes–Electrochemical series– Batteries (primary, secondary and fuel cells)

Corrosion: Causes and effects of corrosion–Theories of corrosion (dry, chemical and electrochemical corrosion)–Factors effecting corrosion–Corrosion control methods–Cathode protection–Sacrificial anodic, Impressed current methods–Surface coatings–Methods of application on metals (Hot dipping, Galvanizing, Tinning, Cladding, Electroplating, Electroless plating)–Organic surface coatings–Paints–Constituents and their functions.

UNIT-V: Fuels and Combustion

Fuels–Introduction–Classification–Calorific value–HCV and LCV–Bomb calorimeter– Problems on calorific value (Theoretical and Experimental)–Coal–Proximate and ultimate analysis–Problems on analysis of coal–Petroleum–Refining–Cracking–knocking–Petrol– Synthetic petrol–Gaseous fuels–Natural gas–LPG, CNG–Junker's gas calorimeter– Combustion–Problems on air requirements–Rocket fuels.

UNIT-VI: Photochemistry

Photo-excitation of organic molecules–Jablonski Diagram–Laws of Photochemistry and quantum yield–Calorimetric analysis–Photochemical equilibrium–Photosensitization–Some examples of photochemical reactions–Chemistry of vision and other applications of photochemistry.

Text Books:

1. Engineering Chemistry, P.C. Jain and M. Jain, Dhanpat Rai & Sons, Delhi.
2. A Textbook of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Sons, Delhi.
3. A Textbook of Engineering Chemistry, S.S. Dara, S. Chand & Co. New Delhi.
4. A Text Book of Engineering Chemistry, N.Y.S. Murthy, V. Anuradha, K. Rama Rao, Maruthi Publications.

5. Engineering Chemistry, B. Sivasankar, (**2010**), McGraw-Hill companies

Reference Books:

1. Engineering Chemistry, K. Sesha Maheswaramma and Mridula Chugh (**2013**), Pearson Publications.
2. A Textbook of Engineering Chemistry, Dr. Y. Bharati Kumari and Dr. Jyotsna Cherukuri, VGS Publications.
3. Text Book of Engineering Chemistry, R. Gopalan, D. Venkatappayya, Sulochana Nagarajan (**2011**), Vikas Publications.
4. Text Book of Engineering Chemistry, C. Parameswara Murthy, C.V. Agarwal, Adhra Naidu (**2006**) B.S. Publications.

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
MATHEMATICAL METHODS (Common to All Branches)							

Course Objectives:

- The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering student.
- The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes:

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

- Solve simultaneous linear equations using matrix methods.
- Calculate Eigen values and Eigen vectors of matrices that are essential for vibration / design analysis.
- Understand the concept of Double and Triple integrals and their applications to calculations of areas, volumes.
- Understand the most basic numerical methods to solve simultaneous linear equations.

UNIT-I: Linear Systems of Equations

Rank of a matrix - Echelon form, Normal form, Solution of linear systems, Direct Methods, Gauss elimination, Gauss Jordon and Gauss Seidal Methods. Solutions of linear simultaneous equations: LU decomposition.

Application: Finding the current in a electrical circuit

UNIT – II: Eigenvalues and Eigenvectors

Eigenvalues, Eigenvectors, Properties, Cayley - Hamilton Theorem, Quadratic forms, Reduction of quadratic form to canonical form, Rank, Positive negative definite, semi definite, index, signature.

Application: Finding powers and inverse of a square matrix using Cayley – Hamilton's Theorem.

UNIT-III: Application of Integration And Multiple Integrals

Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates. Multiple Integrals- double and triple integrals, Change of Variables, Change of order of Integration.

UNIT – IV: Solution of Transcendental Equations

Introduction - Bisection Method – Method of False Position – Iteration Method – Newton-Raphson Method (One variable and Simultaneous Equations), Secant method.

UNIT – V: Interpolation

Introduction – Errors in Polynomial Interpolation – Finite differences – Forward Differences – central differences – Symbolic relations and separation of symbols. Differences of Polynomial – Newton's formulae for Interpolation – Interpolation with unevenly spaced points – Lagrange's Interpolation formula – Newton's Divided difference formula.

UNIT-VI: Numerical Solution of Ordinary Differential Equations

Solution by Taylor's series, Euler's Method, modified Euler's Method, Runge – kutta Method (fourth order only), R-K method for simultaneous differential equations, Trepezoidal rule, Simpon's $(1/3)^{rd}$ rule, Simpons's $(3/8)^{th}$ rule.

Text Book:

1. B.S.Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publisher.

Reference Books:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "Engineering Mathematics", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. V. Ravindranath and P. Vijayalaxmi, Mathematical Methods, Himalaya Publishing House.
3. Dean G Duffy, advanced Engineering Mathematics with MATLAB, CRC Press.
4. Erwyn Kreyszig, Advanced Engineering Mathematics, 9th Edition, wiley-India.
5. Srimanta Pal and Suboth C. bhunia, *"Engineering Mathematics"*, oxford University Press, 2015.
6. Steven C.Chapra, Raymond P.Canale "Numerical Methods for Engineers" Tata Mc-Graw Hill.

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
BASIC COMMUNICATION SKILLS LAB (Common to All Branches)							

Course Objectives:

- To build confidence in the students to communicate effectively in English.
- To strengthen the oral communication to enable them to interact with the people in various social situations.
- To enable the learners develop better pronunciation through emphasis on word accent, intonation and Rhythm.

Course Outcomes:

Learners should be able to

- Improve their basic communication skills to interact with peers and others in various social situations
- Speak English effortlessly with good pronunciation
- Take part in various conversations/discourses using the formal and informal expressions they have learned.

UNIT-1

a. Greeting, Introducing and Taking leave
b. Pure Vowels

UNIT-2

a. Giving information and Asking for information
b. Diphthongs

UNIT-3

a. Inviting, Accepting and Declining Invitations
b. Consonants

UNIT-4

a. Commands, Instructions and Requests
b. Accent and Rhythm

UNIT-5

a. Suggestions and Opinions
b. Intonation

Text Book:

1. Strengthen Your Communication Skills – Maruthi Publications, 2013.

Reference Books:

1. Personality Development and Soft Skills (Oxford University Press, New Delhi)
2. J.D.O Conner, Better English Pronunciation, Cambridge University Press 1980
3. T.Balasubramanian, A Text Book of English Phonetics for Indian Students, Macmillan, 1981
4. Sanjay Kumar, Pusph Latha, Communication skills, Oxford University Press 2005

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
ENGINEERING CHEMISTRY LAB (Common to All Branches)							

Course Objectives:

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

Course Outcomes:

- On completion of this course, students will have the knowledge in, Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results, and
- Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.

LIST OF EXPERIMENTS

Introduction to chemistry laboratory–Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.

VOLUMETRIC ANALYSIS

1. Estimation of NaOH using standard HCl solution
2. Estimation of Mohr's salt using potassium dichromate ($K_2Cr_2O_7$) solution
3. Estimation of $CuSO_4$ using sodium thiosulphate ($Na_2S_2O_3$) solution.

WATER ANALYSIS

4. Determination of hardness of water sample by EDTA method
5. Determination of alkalinity of water sample
6. Determination of free chlorine in bleaching powder
7. Determination of turbidity of water sample

CONDUCTOMETRIC TITRATIONS

8. Conductometric titration between strong acid and strong base (HCl + NaOH)
9. Conductometric titration between mixture of acids and strong base (HCl and CH_3COOH + NaOH)

FOOD ANALYSIS

10. Estimation of Vitamin-C

PREPARATION OF POLYMERIC RESINS

11. Preparation of phenol formaldehyde resin
12. Preparation of urea formaldehyde resin

Text Books:

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. A text book on experiments and calculation Engg. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications
4. Chemistry Practical Manual, Lorven Publications
5. Inorganic quantitative analysis, Vogel.

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
COMPUTER PROGRAMMING LAB (Common to ECE,EEE,CIVIL and Mechanical)							

Course Objective:

- The purpose of this course is to introduce to students to the field of language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

Course Outcomes:

After completion of this C Programming Lab, students should be able to:

- Study, analyse and understand logical structure of computer programming and different constructs to develop programs in C Language.
- Know how to write, compile and debug programs in C Language.
- Understand and analyse data types, typecasting and operator precedence.
- Analyse the use of conditional and looping statements to solve problems associated with conditions and repetitions.
- Explain and analyse simple data structures, use of pointers and dynamic memory allocation techniques.
- Summarize the role of functions involving the idea of modularity, know how to create files and apply file I/O operations.

Exercise l

a) Write an Algorithm, Flowchart and Program to calculate the area of triangle using the formula Area = (s (s-a) (s-b) (s-c)) 1/2 where s= (a+b+c)/2.
b) Write an Algorithm, Flowchart and Program to find the largest of three numbers using ternary operator.
c) Write an Algorithm, Flowchart and Program to swap two numbers without using a temporary variable.

Exercise 2

a) Write a C program to find the roots of a quadratic equation.
b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

Exercise 3

a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.
b) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.
b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.
c) Write a C Program to check whether the given number is Armstrong number or not.

Exercise 5

a) Write a C program to interchange the largest and smallest numbers in the array.
b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

Exercise 6

a) Write a C Program to find both the largest and smallest number of an array of integers
b) Write a C Program to find transpose of a matrix.

Exercise 7

Write C programs that use both recursive and non-recursive functions for the following
a) To find the factorial of a given integer.
b) To find the GCD (greatest common divisor) of two given integers.

Exercise 8

Write a C Program for the following.
a) To find Fibonacci sequence
b) Write C programs illustrating call by value and call by reference concepts.

Exercise 9

Write C Programs for the following string operations without using the built in functions - to concatenate two strings
a) To append a string to another string
b) To compare two strings

Exercise 10

Write C Programs for the following string operations without using the built in functions
a) To find the length of a string
b) To find whether a given string is palindrome or not

Exercise 11

Write a C program that uses functions to perform the following operations:
a) To insert a sub-string in to given main string from a given position.
b) To delete n Characters from a given position in a given string.
c) To replace a character of string either from beginning or ending or at a specified location

a) Write a C program to implement a linear search.
b) Write a C program to implement binary search
c) Write a C program to implement sorting of an array of elements

Exercise 13

a) Write C Program to reverse a string using pointers
b) Write a C Program to compare two arrays using pointers
c) Write a C program to swap two numbers using pointers

Exercise 14

Examples which explores the use of structures, union and other user defined variables

Exercise 15

a) Write a C program which copies one file to another.
b) Write a C program to count the number of characters and number of lines in a file.
c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

Text Books:

1. Programming in C, Reema Thareja, OXFORD
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed.

Reference Books:

1. Programming in ANSI C, Dr.E.Balaguruswamy, Tata McGraw-Hill Education.
2. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PEARSON.
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.
4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

I B.TECH II SEMESTER

II B.TECH. - I SEMESTER COURSE STRUCTURE

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Electrical Circuit Analysis – II	PC	3	1	-	40	60	100	3
2	Electronic devices and Circuits	ES	3	1	-	40	60	100	3
3	Electro Magnetic Fields	PC	3	1	-	40	60	100	3
4	Fluid Mechanics and Prime Movers	ES	3	1	-	40	60	100	3
5	Complex Variables and Statistical Methods	BS	3	1	-	40	60	100	3
6	Electrical Machines-I	PC	3	1	-	40	60	100	3
7	Electrical Circuits Lab	PC	-	-	3	25	50	75	2
8	Electronic devices and Circuits Lab	ES	-	-	3	25	50	75	2
9	Verbal Ability	MC	3	-	-	-	-	-	-
	Total		21	6	6	290	460	750	22

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
INTERACTIVE ENGLISH (Common to All Branches)							

Course Objectives:

- To enable the engineering students develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To enhance the skills of listening, reading and critical thinking.
- To integrate English Language learning with training for employability skills.

Course Outcomes:

Learners are able to

- Speak clearly, effortlessly, confidently and effectively.
- Write coherently and flawlessly, organizing ideas logically.
- Listen and read to comprehend different discourses and different genres of texts.

Teaching Methodology:

The methodology of teaching will be chalk and talk, PPT, audio-visual, and activity based

PART-I COMMUNICATION SKILLS

Hours of Instruction per week: 8

PART-I Objectives:

1. Understand the significance of using formal language in communication and Identify different language patterns in communication.
2. Understand the importance of clarity and conciseness of writing.
3. To enhance word power and usage of lexicons among the learners.

PART-I Outcomes:

1. Apply Formal and Informal Language in office correspondence and real life situations.
2. Apply the Clarity, Conciseness and Formal language in E-mail writing, letter writing, report writing, paragraph writing and essay writing.
3. Use words in different contexts while speaking and decipher meaning of the words contextually while reading.

1. Effective communication

a. Role and significance of communication
b. Features of Human Communication
c. Process of Communication
d. Types of Communication, barriers to communication

2. Oral Communication

a. Importance of Listening for effective communication
b. Interpersonal communication
c. Models of Interpersonal relationship development

d. Styles of communication
e. Persuasion techniques
f. Telephone and Cell phone etiquette

3. Written Communication

a. Paragraph writing b. Summaries c. Expansion of Proverbs d. Essay writing e. Report writing f. The scientific paper g. Letter writing h. Letters of Complaint i. Request to complaint j. letters of inquiry and responses k. Resume writing l. Visumes m. statement of purpose n. E-mail
(Fundamentals of technical communication Pg. No. 119 - 153)

Remedial English

a. Importance of vocabulary and grammar,
b. Homonyms, Homophone and Homographs
c. Synonyms and antonyms
d. One word substitutes
e. Idioms
f. Words often confused
g. Subject-Verb agreement
h. active and passive voice
i. direct and indirect speech
j. Articles
k. Adjectives
l. Prepositions
m. Tense and aspect
n. Suffixes
o. Question tags
p. Prefixes
q. Punctuation
r. Common Errors
s. Correction of common errors

PART-II Objectives:

PART-2

READING FOR ENRICHMENT

To inspire the learners by giving the success stories of the various fields and teach them that achievement comes only after burning the midnight oil.

PART-II Outcomes:

The students will emulate the achievers and develop perseverance, determination, dedication and industry

1. APJ Abdul Kalam
2. An Interview with Microsoft CEO Satya Nadella
3. Azim Premji
4. Sachin Tendulkar
5. Sam Pitroda: The Knowledge Revolution
6. Indra Nooyi: http://www.thefamouspeople.com/profiles/indra-nooyi-6440.php

Text Book:

1. E Suresh Kumar, *Engineering English* –Orient Black Swan Pvt.Ltd.Publishers

Reference Books:

1. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: *Principles and Practice.* Oxford University Press, New Delhi. 2011
2. Rutherford, Andrea. J *Basic Communication Skills for Technology*. Pearson, New Delhi. 2001
3. Raymong Murphy, *Murphy's English Grammar,* Cabridge University Press 2004
4. Meenakshi Raman, Sangeeta Sharma. *Technical Communication: English Skills for*

Engineers, Oxford University Press, 2009

5. Meenakshi raman, Sangeeta Sharma, *Fundamentals of technical communication*, Oxford University Press, 2015.

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
ENGINEERING PHYSICS (Common to All Branches)							

Course Objectives:

- Physics is the foundation subject to all engineering and through the study in engineering physics the main aim is blending a strong physics component with relevant engineering backgrounds that are usually necessary to work in areas such as semiconductor, optical technologies, mechanical, electrical, and civil engineering. The students will get their traditional undergraduate engineering education that has a broad foundation in mathematics, engineering sciences and technology. This program emphasizes problem solving skills and an understanding of engineering design to address the needs and challenges of the technology age and allow students to take a broad range of engineering careers.

Course Outcomes:

Students will be able to

- Understand the difference between classical and quantum mechanics
- Analyze and understand semiconductor technology and various types of lasers & optical fibers.
- Knows the applications of ultrasonic's in engineering and medicine
- Will recognize the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and polarizer's in various fields.
- Recognize the importance of lasers in various fields.
- Learn the crystal structures and XRD techniques.
- Realize about the various applications of semiconductors in engineering & technology.

UNIT-I

Interference: Introduction – Coherent Sources -Interference in thin films by reflection – Newton's rings – Principle – construction- determination of radius of curvature of plano convex lens.

Diffraction : Introduction – Fraunhofer diffraction - Fraunhofer diffraction at single slit-double slit (qualitative) – Diffraction grating – Grating spectrum

Polarization: Introduction – Types of Polarization – Double refraction – Quarter wave plate ad Half Wave plate

UNIT-II

Lasers: Introduction – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Ruby laser – Helium Neon laser-Applications

Fiber Optics: Introduction- Principle of optical fiber - Acceptance angle – cone - Numerical Aperture-Applications.

UNIT-III

Crystallography : Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC.

X- Ray Diffraction Techniques: Directions and planes in crystals – Miller indices – Separation between successive (h k l) planes – Bragg's law.

UNIT – IV

Ultrasonic: Introduction – properties - Production of Ultrasonic waves –Piezo electric effect, Magnetostriction methods -Applications.

Acoustics: Introduction-Sound absorption-absorption coefficient-Reverberation Time- Sabine's formula-Eyring's formula

UNIT – V

Free electron theory: Classical free electron theory – Quantum free electron theory – Fermi dirac (analytical) and its dependence on temperature-Fermi energy-Density of states.

Quantum Mechanics: Introduction – Matter waves – Physical significance of wave function

- Schrodinger Time Independent wave equations – Particle in a one dimensional potential box.

UNIT – VI

Band Theory of Solids: Bloch theorem (qualitative) – Kronig-Penny model - boundary conditions-origin of energy band formation in solids- concept of effective mass of electron and hole-classification of materials into conductors, semiconductors and insulators.

Semiconductor Physics: Introduction –Intrinsic, Extrinsic semiconductor and carrier concentrations – Fermi level in intrinsic and extrinsic semiconductors- Hall Effect.

Text Books:

1. Solid state Physics by A.J. Dekker (Mc Millan India Ltd)
2. A text book of Engineering Physics by M.N. Avadhanulu & P.G. Kshirasagar (S. Chand publications)
3. Engineering Physics by Palanisamy (Scitech Publishers)
4. Engineering Physics by M.R. Srinivasan (New Age international publishers)

Reference Books:

1. Introduction to solid state physics by Charles Kittle (Willey India Pvt.Ltd)
2. Applied Physics by T. Bhimasenkaram (BSP BH Publications)
3. Applied Physics by M.Arumugam (Anuradha Agencies)
4. Engineering Physics by D.K.Bhattacharya (Oxford University press)
5. Engineering Physics by Mani Naidu S (Pearson Publications)
6. Engineering Physics by Sanjay D Jain and Girish G Sahasrabudhe (University Press)
7. Engineering Physics by B.K.Pandey & S. Chaturvedi (Cengage Learning)

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
ENVIRONMENTAL STUDIES (Common to All Branches)							

Course Objectives:

- To make the students aware about the environment and it's inter–disciplinary, Basic understanding of the ecosystem and its diversity.
- Human development and societal development is inevitable. This development is entirely depends on science and Technological advancement through using resource assets of nature. In order to reduce the impacts of the technological development, the environmental studies creating awareness among the engineering graduates. So that we can have a healthy environment present and future.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- The course covers the aspects like general awareness, Resources, Utilization and conservation, Healthy sustenance of life, pollution control, social aspects, etc. All these areas will provide and habituate the students towards conservation and sustainable development.
- Overall understanding of the natural resources.

Course Outcomes:

- The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.
- The knowledge about environmental studies is applicable as and when required like implementing any developmental activity can overcome the hurdles? In relation to environmental aspects.
- Students can develop eco-friendly technologies for a healthy growth, and development of anation which can prevent the environmental hazards by appropriate decisions and alternate remedies.
- To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.
- The biodiversity of India and the threats to biodiversity and conservation practices to protect the biodiversity.
- About environmental assessment and the stages involved in EIA and the environmental audit.

UNIT–I: Multidisciplinary Nature of Environmental Studies

Definition, Scope and importance–Need for public awareness–Institutions and people in environment.

Ecosystems: Definitions and concepts–Characteristics of ecosystem–Structural and functional features–Producers, consumers, decomposers and food webs–Types of ecosystems–Forests, grassland, desert, crop land, pond, lake, river and marine ecosystems– Energy flow in the ecosystem–Ecological pyramids–Ecological successions.

UNIT–II: Natural Resources

Forest resources: Use and over–exploitation–Deforestation–Water resources–Use and over utilization of surface and natural resourced ground water–Floods and droughts–Conflicts over water–Dams, benefits and problems on tribal population & Environment.

Mineral resources: Use and exploitation–Environmental effects of extracting and using mineral

resources.

Food resources: World food problems–Changes caused by agriculture and overgrazing– Effects of modern agriculture–Fertilizer and pesticide problems–Water logging, salinity– Concept of sustainable agricultural methods.

Land resources: Land as a resource–Land degradation, man induced landslides–Soil erosion and desertification.

UNIT–III: Biodiversity and its Conservation

Levels and Values of biodiversity–India as a mega diversity nation–Hotspots–Threat and conservation of biodiversity–Assessment of biodiversity and its impact on Environment.

UNIT–IV: Environmental Pollution and Control

Definition, Cause, effects and control measures of

a. Air pollution
b. Water pollution
c. Soil pollution
d. Noise pollution.

UNIT–V: Global Environmental Problems and Global Efforts

Climate change–Global warming–Acid rain–Ozone layer depletion–Nuclear accidents and holocaust–Rain water harvesting–Traditional and modern techniques–Environmental legislation–Wasteland reclamation–Consumerism and waste products.

UNIT–VI: Environmental Management

Impact Assessment and its significance–various stages of EIA–Preparation of EMP and EIS–Environmental audit–Ecotourism. The student should submit a report individually on any issues related to environmental studies course and make a power point presentation.

Text Books:

1. An Introduction to Environmental Studies by B. Sudhakara Reddy, T. Sivaji Rao, U. Tataji & K. Purushottam Reddy, Maruti Publications.
2. Anubha Kaushik & C.P. Kaushik. 2014, Environmental Studies, Fourth edition, New Age International (P) Ltd., New Delhi.

Reference Books:

1. Text Book of Environmental Studies by Deekshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada.
3. Text Book of Environmental Sciences and Technology by M. Anji Reddy, BS Publications.
4. Bharucha, E. **2005**, Text book of Environmental Studies, First edition, Universities Press (India) Pvt., Ltd., Hyderabad.
5. Dr. S. Keerthinarayana & Dr. C. Daniel Yesudian. **2004**, *Principles of Environmental Scienceand Engineering, First edition*, Anuradha Publications (P) Ltd., Kumbakonam.
6. P. Anandan & R. Kumaravelan. **2010**, *Environmental Science & Engineering, Sixth reprint*, Scitech Publications (India) (P) Ltd., Chennai.
7. Dr. Surinder Deswal & Dr. Anupama Deswal. **2008-09**, A *Basic Course in Environmental Studies, Second revised edition*, Dhanpat Rai & Co (P) Ltd., New Delhi.

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	4	40	60	100	3
ENGINEERING GRAPHICS (Common to CSE, ECE & EEE)							

Course Objectives:

The course is mainly intended to

- Impart basic knowledge and skills required to prepare engineering drawing which is an universal language of engineers for communication, designing and production
- Get enhanced imagination capacity, visualize and communicate geometrical elements
- Understand the fundamentals of geometry like engineering curves, planes, solids, sections, developments & isometric views and its applications in design and manufacturing of various engineering components

Course Outcomes:

At the end of this course student will acquire ability to

- Apply principles of drawing to represent dimensions of an object and use the different types of scales for drawing of various sizes of engineering curves
- Draw various polygons and Ellipse
- Draw Orthographic projections in 1st and 3rd angle projections
- Draw different orientations of points, lines, planes and solids with reference to principal planes.
- Draw orthographic views (2D) from the given isometric view (3D) and vice versa

UNIT-I

Introduction to engineering drawing: Importance, Drawing Instruments and their uses. Basics of Geometric construction.

Polygons: Construct the regular polygons using given length of a side, inscription of polygons and circumscription of polygons.

Ellipse- Arcs of circles Method and Oblong Method

Scales: Representation fraction-Construction of plain, diagonal and vernier scale.

UNIT-II

Orthographic projections: Principle of orthographic projections, first and third angle projections, projections of points.

Projection of Straight lines: parallel to both the planes, parallel to one plane and inclined to the other plane.

UNIT-III

Projection of Straight lines inclined to both the planes, determination of true length, angles of inclination and Traces.

UNIT-IV

Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.UNIT-V

Projections of solids-prisms, pyramids, cones and cylinders with the axis inclined to one of the planes

UNIT-VI

Conversion of isometric views to orthographic views; Conversion orthographic views to isometric views.

Text Books:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers

Reference Books:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
INTEGRAL TRANSFORMS AND VECTOR CALCULUS (Common to All Branches)							

Course Objectives:

- The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering student.
- The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes:

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

- Learn the technique of Laplace transform and apply it to solve differential equations.
- Learn the technique of Z-transform and apply it to solve difference equations.
- Extend the concept of integration to vector functions, understand the significance of the operators, gradient, divergence and curl.
- Understand Fourier series, integral, transforms and they are provided with practice in their application and interpretation in a range of situations.
- Find surface areas and Volumes of certain solids using Green, Stokes and Gauss divergence theorems.

UNIT –I: Laplace Transformations

Laplace transform and its properties, Unit step function and unit impulse function, Transform of periodic functions, Transform of derivatives and integrals, Multiplication by t^n, division by t, evolutions of integrals by Laplace Transforms. Inverse Laplace Transformations. Introduction, Finding inverse transforms by the method of partial fractions, other methods of finding inverse Laplace Transforms, Convolution theorem(without proof), Solutions Initial and Boundary Value Problems.

UNIT –II: Z – Transforms

Introduction, properties, Damping rule, Shifting rule, Initial and Final value theorems, Inverse z-transform, Convolution theorem, Solutions of difference equations.

UNIT–III: Fourier Series

Introduction, Euler's Formulae, Conditions for a Fourier expansion, Functions having points of Discontinuity, change of interval, even and odd functions, Half – range sine and cosine series.

UNIT–IV: Fourier Transforms

Introduction, Definition, Fourier Integrals, Fourier Sine and Cosine Integral, Fourier Transforms, Fourier sine and cosine transforms, Finite Fourier transforms.

UNIT-V: Vector Differentiation

Gradient, Divergence, Curl, Laplacian and second order operators, vector identities, Equation of continuity, potential surfaces.

UNIT-VI: Vector Integration

Line integral, work done, potential function, area surface and volume integrals, vector integral theorems: Green's, Stoke's and Gauss Divergence theorems (without proof) and related Problems.

Text Book:

1. B.S.Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publisher.

Reference Books:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "Engineering Mathematics", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGrawhill.
3. ErwynKreyszig, Advanced Engineering Mathematics, 9thEditiwiley-India.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage Learning, 2011.
5. Srimanta Pal and Suboth C. bhunia, *"Engineering Mathematics"*, oxford University Press, 2015.

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
ELECTRIC CIRCUIT ANALYSIS-I							

Course Objectives:

- To study the concepts of passive elements, types of sources and various network reduction techniques.
- To understand the behavior of RLC networks for sinusoidal excitations.
- To understand the concept of resonance.
- To understand the applications of network topology to electrical circuits.
- To understand the applications of network theorems for analysis of electrical networks.
- To study the concept of magnetic coupled circuit.

Course Outcomes:

Students are able to solve

- Various electrical networks in presence of active and passive elements.
- Any R, L, C network with sinusoidal excitation.
- Any R, L, C network at resonance condition.
- Electrical networks with network topology concepts.
- Electrical networks by using principles of network theorems.
- Any magnetic circuit with various dot conventions.

UNIT-I: Introduction to Electrical Circuits

Passive components and their V-I relations. Sources (dependent and independent) , Ohm's Law-Kirchhoff's laws, Network reduction techniques(series, parallel, series - parallel, star- to-delta and delta-to-star transformation). source transformation technique, nodal analysis ,mesh analysis, super node and super mesh analysis for D.C.excitatons.

UNIT-II: Single Phase A.C. Circuits

Periodic waveforms (determination of rms, average value and form factor). Concept of phase and phase difference. Complex and polar forms of representations, steady state analysis of R, L and C circuits with sinusoidal excitation, Power Factor and its significance, Real, Reactive power and apparent Power.

UNIT-III: Resonance

Resonance, series and parallel circuits, concept of band width and Quality factor.

UNIT-IV : Network Topology

Definitions of Graph and Tree. Basic cutset and tieset matrices for planar networks. Loop and nodal methods of analysis of networks with dependent and independent voltage and current sources. Duality and Dual networks.

UNIT-V: Network Theorems (DC & AC Excitations)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem, Tellegen's theorem and compensation theorem.

UNIT-VI : Magnetic Circuits

Basic definition of MMF, flux and reluctance. Analogy between electrical and magnetic circuits.

Composite magnetic circuits. Faraday's laws of electromagnetic induction Concept of self and mutual inductance. Dot convention, coefficient of coupling. Analysis of series and parallel magnetic circuits.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,Mc Graw Hill Company,6 th edition.
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.

Reference Books:

1. Introduction to Circuit Analysis and Design by Tildon Glisson. Jr, Springer Publications.
2. Electric Circuit Analysis by K.S. Suresh Kumar, Pearson publications
3. Electric Circuits by David A. Bell, Oxford publications.
4. Introductory Circuit Analysis by Robert L Boylestad, Pearson Publications.
5. Circuit Theory(Analysis and Synthesis) by A.chakrabarthi,Dhanpat Rai&co.

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
ENHANCING COMMUNICATION SKILLS LAB (Common to All Branches)							

Course Objectives:

1. To train the students to use language effectively in professional situations like group discussions, public speaking, presentations and interviews.
2. To make the students understand the importance of body language.
3. To develop positive attitude and soft skills to improve their employability quotient.
4. To expose the students to variety of a self-instructional, learner friendly, electronic media and stimulate intellectual faculties/resources

Course Outcomes:

Learners are able to

1. Give presentations and attend job interviews confidently.
2. Speak confidently in challenging situations.
3. Know the importance of Non-verbal communication and interpret nonverbal symbols
4. Face computer based competitive exams like GRE, TOFEL, and IELTS.
5. Unit-1: Body Language
6. Unit-2: Dialogues
7. Unit-3: Presentation Skills
8. Unit-4: Group Discussion
9. Unit-5: Interviews and Telephonic Interviews
10. Unit-6: Debates

Text Book:

Strengthen your Communication Skills by Maruthi Publications, 2013

Reference Books:

1. *Personality Development and Soft Skills* (Oxford University Press, New Delhi)
2. M Ashraf Rizvi, *Effective Technical Communication skills*, McGraw-Hill, 2005
3. Barun K Mitra, *Personality Development and Soft Skills*, Oxford University Press, 2011
4. Konar N, *Communication Skills for Professionals*, PHI Learning Private Limited, 2011

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
ENGINEERING PHYSICS LAB (Common to All Branches)							

Course Objective:

- The main aim of the course is to acquaint the students with basic concepts in Engineering Physics using the following illustrative list of experiments.

Course Out comes:

- These experiments in the laboratory are helpful in understanding important concepts of physics through involvement in the experiments by applying theoretical knowledge.
- It helps to recognize where the ideas of students agree with those accepted by physics and where they do not.

List of Experiments

1. Newton's rings –Radius of Curvature of Plano Convex Lens.
2. Determination of thickness of thin wire- Air wedge method
3. Determination of wavelength of a source-Diffraction Grating-Normal incidence
4. Determination of wavelength of Laser Source-single slit diffraction.
5. Determine the Numerical aperture of an optical fiber.
6. Determination of velocity of ultrasonic waves in liquids-ultrasonic interferometer.
7. Melde's experiment – Transverse and Longitudinal modes.
8. Determination of velocity of sound-Volume resonator
9. Verification of laws of vibrations in stretched strings -Sonometer.
10. Hall effect in semiconductors
11. Energy Band gap of a Semiconductor p - n junction.
12. Characteristics of Thermistor- Temperature coefficient

Reference Books:

1. Engineering Physics Lab Manual by Dr.Y. Aparna & Dr.K.Venkateswarao (V.G.S.Book links).
2. Physics Practical Manual, Lorven Publications.

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
ELECTRICAL AND IT WORKSHOP LAB							

ELECTRICAL WORK SHOP LABORATORY

Course Objectives:

- Know various wiring connections.
- Know how to make circuit boards
- Practice Lamp Circuits.

Course Outcomes:

- Getting knowledge on wiring connections.
- Getting knowledge on various lamp circuit connections.
- Getting knowledge on soldering of devices.

LIST OF EXPERIMENTS

1. One lamp controlled by one switch.
2. Two lamps controlled by two independent switches.
3. One lamp controlled by one switch and provision of 2/3 plug socket with switch control.
4. Stair case wiring.
5. Godown wiring.
6. Soldering and de soldering of simple electrical devices.
7. Practicing of resistance measurement.
8. House wiring (wiring of energy meter, main switch board and one sub circuit).
9. Wiring of fluorescent lamp.
10. Two lamps controlled by one switch.
11. Wiring of mercury vapour lamp.
12. Series and parallel connection of lamps (DIM&BRIGHT).

IT WORKSHOP LAB

Course Objectives:

- Enabling the student to understand basic hardware and software tools through practical exposure.

Course Outcomes:

After completion of this course, the students gain

- Knowledge on computer system such as system unit, input devices, output devices connected to the computer.
- Knowledge to understand the booting process and loading of the operating system, and getting it ready for use.
- Knowledge to understand the working of the internet that includes the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.
- Knowledge to familiarize with parts of Word window, Excel window and PowerPoint.

SYLLABUS:

1. PC Hardware:
Identification of basic peripherals, assembling a PC, installation of system software like MS Windows, device drivers. Troubleshooting Hardware and Software some tips and tricks.

2. Internet & World Wide Web:
Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber-attacks.

3. Productivity tools: Crafting professional word documents; excel spread sheets, power point presentations and personal websites using the Microsoft suite of office tools.
(Note: Student should be thoroughly exposed to minimum of 12 Tasks)

4. PC Hardware
Task a: Identification of the peripherals of a computer.
To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices.
Task b: (Optional): A Practice on disassembling the components of a PC and assembling them to back to working condition.
Task c: Examples of Operating Systems- DOS, MS Windows, Installation of MS windows on a PC
Task d: Introduction to Memory and Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, Loaders.

Task e:
Hardware Troubleshooting (Demonstration): Identification of a problem and fixing a defective PC (improper assembly or defective peripherals).
Software Troubleshooting (Demonstration): Identification of problem and fixing the PC for any software issues.

5. Internet & Networking Infrastructure
Task: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth technology, Wireless Technology, Modem, DSL, and Dialup Connection.

6. Orientation & Connectivity Boot Camp and Web Browsing: Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.

Task: Search Engines & Netiquette:
Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc).Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums.
Task: Cyber Hygiene (Demonstration) : Awareness of various threats on the internet. Importance of Security patch updates and Anti-Virus solution Ethical Hacking, Firewalls, Multi-factors authentication techniques including Smart card Biometrics and also practiced.

7. Word
Task a: MS Word Orientation:

Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting, Drop Cap, Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving.

Task b : Creating Project : Abstract Features to be covered:-Formatting Styles, Inserting Table, Bullets and Numbering, Changing Text Direction, Cell alignment, footnote, Hyperlink, Symbols, Spell Check, Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

8. Excel

Task a: Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations.

Task b: Creating Scheduler - Features to be covered:-Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task c: LOOKUP/VLOOKUP

Task d: Performance Analysis: Features to be covered:-Split cells, freeze panes, group and outline, Sorting, Boolean and Logical operators, Conditional Formatting.

9. Power Point

Task a: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes:- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in PowerPoint.

Task b: Focusing on the power and potential of Microsoft power point Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes:- Master Layouts (slide, template and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background , textures, Design Templates, Hidden slides, OLE in PPT.

10. UNIX Commands

11. Algorithms

12. Flowcharts

Text Books:

1. Computer Fundamentals, Anita Goel, Pearson
2. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller QUE, Pearson, 2008
3. Information Technology Workshop, 3e, G Praveen Babu, M V Narayana BS Publications.
4. Comdex Information Technology, Vikas Gupta, dreamtech

Reference Books:

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Venkateswarlu.
2. How to solve it by Computer, R.G. Dromey, PHI.

II B.TECH I SEMESTER

II B.TECH. - I SEMESTER COURSE STRUCTURE

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Electrical Circuit Analysis – II	PC	3	1	-	40	60	100	3
2	Electronic devices and Circuits	ES	3	1	-	40	60	100	3
3	Electro Magnetic Fields	PC	3	1	-	40	60	100	3
4	Fluid Mechanics and Prime Movers	ES	3	1	-	40	60	100	3
5	Complex Variables and Statistical Methods	BS	3	1	-	40	60	100	3
6	Electrical Machines-I	PC	3	1	-	40	60	100	3
7	Electrical Circuits Lab	PC	-	-	3	25	50	75	2
8	Electronic devices and Circuits Lab	ES	-	-	3	25	50	75	2
9	Verbal Ability	MC	3	-	-	-	-	-	-
	Total		21	6	6	290	460	750	22

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Electrical Circuit Analysis - II							

Course Objectives:

- To study the concepts of balanced &unbalanced three-phase circuits
- To study the transient behavior of electrical networks with DC and AC excitations.
- To study the performance of a network based on input and output excitation/response.
- To study the basic concepts of different types of filters.
- To understand the application of Fourier series and Fourier transforms for analysis of electrical circuits.

Course Outcomes:

Students are able to

- Solve three- phase circuits under balanced & unbalanced condition.
- Find out transient response of electrical networks with different types of excitations.
- Estimate the different types of two port network parameters.
- Design k and m filters.
- Extract different harmonics components from the response of electrical network.

UNIT-I: Balanced three phase circuits

Poly phase system - Advantages of a three phase system - Generation of three phase voltages- Phase sequence - star and delta connection - Relation between line and phase voltages and currents in balanced systems - Analysis of balanced three phase circuits - Three phase four wire supply connected to balanced star connected load - Three phase three wire supply connected to balanced star connected load - Three phase three wire supply connected to balanced delta connected load - Measurement of active and reactive power in balanced three phase systems.

UNIT-II: Unbalanced Three phase circuits

Analysis of three phase unbalanced circuits: Three phase four wire supply connected to unbalanced star connected load - Three phase three wire supply connected to unbalanced star connected load- Loop method - Star-Delta transformation technique -Three phase three wire supply connected to unbalanced delta connected load - Three wattmeter method and Two wattmeter methods for measurement of three phase power - Power factor by Two wattmeter method.

UNIT-III: Transient Analysis in DC and AC circuits

Steady state and transient response of a circuit - Transient response of R-L, R-C, R-L-C circuits for DC and AC excitations - Solution using differential equations and Laplace transforms.

UNIT-IV: Two Port Networks

Two Port network - Z parameters - Y parameters - Transmission line parameters - h- parameters - Inverse h parameters - Inverse Transmission line parameters - Relationship between parameter sets - T and π representation - series connection of two port networks - Parallel connection of two port networks - Cascading of two port networks - Lattice Network.

UNIT-V: Filters

Classification of Filters - Low pass filter - High pass filter - Band pass filter - Band elimination filter - Filter networks - Equations of Filter networks - T network-Propagation constant of T network - π network - Propagation constant of π network - Classification of Pass band and stop

band - characteristic Impedance in the Pass and Stop bands - Constant-K Low pass Filter - Constant-K high pass Filter - m Derived T-section - m Derived low pass filter - m Derived high pass filter - Band pass filter - Band elimination Filter.

UNIT-VI: Fourier analysis and Transforms

Fourier theorem -Trigonometric form and exponential form of Fourier series-Conditions of symmetry- line spectra and phase angle spectra, Analysis of electrical circuits to non- sinusoidal periodic waveforms - Fourier integrals and Fourier transforms - properties of Fourier transforms and application to electrical circuits.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw HillCompany,6th edition.
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.
3. Electric Circuit Analysis-II by A Sudhakar and Shyammohan S Palli, McGraw Hill Education (India) Private Limited.

Reference Books:

1. Introduction to circuit analysis and design by TildonGlisson. Jr,Springer Publications.
2. Circuits by A.Bruce Carlson, Cengage Learning Publications.
3. Network Theory by N.C.Jagan & C.Lakshminarayana, Anshan publications.
4. Networks and Systems by D. Roy Choudhury, New Age International publishers.
5. Electric Circuits by David A. Bell, Oxford publications.
6. Circuit Theory (Analysis and Synthesis) by A.chakrabarthi, DhanpatRai&co.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Electronic Devices and Circuits							

Course Objectives:

Students undergoing this course are expected to

- Know the properties of semiconductor materials.
- Understand the operation and principles of P-N diode and special diodes.
- Understand various types of rectifiers and filters.
- Know the working of BJT and need for transistor biasing and stabilization.
- Know the working of FET and other Transistors.

Course Outcomes:

After completion of the course, students will be able to

- Explore the semiconductors.
- Use P-N diodes and special diodes in electronic circuits.
- Analyze BJT and its thermal stability.
- Explore the operation of FET, other transistors and their applications.

UNIT-I: Overview of Semiconductors

Insulators, Semiconductors and Metals – Classification using Energy gap, Intrinsic and Extrinsic Semiconductors – Electrons and Holes, Conductivity, Mobility, Drift and Diffusion Currents, Transportation of Charge Carriers - Generation and Recombination of Carriers, Charge Densities in Semiconductors, Hall Effect - Quantitative Analysis and Applications, Continuity Equation, Mass Action Law, Einstein's Equation, Fermi level in intrinsic and extrinsic semiconductors.

UNIT- II: Junction Diode Characteristics

P-N Junction Diode - Formation of P-N Junction, Open Circuited P-N Junction, Biased P-N Junction-Forward Bias, Reverse Bias, Current Components in PN Junction Diode, Law of Junction, Diode Current Equation-Quantitative Analysis, V-I Characteristics of Diode- Forward Bias, Reverse Bias, Breakdown in P-N Junction Diode, Temperature Dependence on V-I Characteristics, Diode Resistance-Static Resistance, Dynamic Resistance, Reverse Resistance, Diode Capacitance-Transition Capacitance, Diffusion Capacitance, Energy Band Diagram of PN Junction Diode.

UNIT- III: Special Diodes and Rectifiers

Zener Diode-V-I Characteristics, Applications, Breakdown Mechanisms - Zener Breakdown and Avalanche Breakdown, Construction, Operation, Characteristics and applications of LED, LCD, Photodiode, Varactor Diode and Tunnel diode. Basic Rectifier setup**,** Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Inductive and Capacitive Filters, L– Section and π- Section, Derive and compare rectifier parameters with and without filter.

UNIT- IV: Bipolar Junction Transistor (BJT)

Bipolar Junction Transistor – Types, Symbols and Operation, Transistor Current Components, Transistor Equation - Relation among I_C, I_B, I_{CBO}, Transistor Configurations - CB, CE and CC, Transistor as a switch, Transistor switching times, Transistor as an Amplifier, Characteristics of Transistor in Common Base Configuration, Common Emitter and Common Collector Configurations - Input and output characteristics, Early effect, Transistor parameters, Current amplification factor, Relation among α, β, and γ, Comparison of CB, CE and CC Configurations, Punch Through/ Reach through, Typical transistor junction voltage values, Photo Transistor.

UNIT- V: BJT Biasing

Need For Biasing, Operating Point, Load Line Analysis-D.C. Load Line, A.C. Load Line, Biasing - Methods, Basic Stability, Fixed Bias, Collector-to-base Bias and Self Bias.

UNIT- VI: FET& other Transistors

FET Types and Symbols - JFET and MOSFET/IGFET, JFET: N-Channel and P-Channel Construction, Operation, Characteristics - Drain and Transfer, Parameters-Drain Resistance, Amplification factor, Transconductance, Pinch- offvoltage**,** MOSFET - Types-Depletion MOSFET - N Channel and P Channel, Enhancement MOSFET- N-Channel and P-Channel, Construction, Operation, Characteristics - Transfer and Drain Characteristics for Depletion and Enhancement Modes , Comparison between JFET and MOSFET. SCR- Symbol, Two- Transistor version, UJT-Negative Resistance Property and Applications**.**

Text Books:

1. Electronic Devices and Circuits – J. Millman, C. Halkias, Tata McGraw-Hill, Third Edition, 2010.
2. Electronic Devices and Circuits – Allen Mottershed, PHI, 2011.
3. Electronic Devices and Circuits–Salivahanan, N. Suresh Kumar, A. Vallavaraj, Tata McGraw-Hill, Second Edition, 2008.

References Books:

1. Integrated Electronics– Jacob Millman, C. Halkies, C.D. Parikh, SatyabrataJit, Tata McGraw-Hill, Second Edition, 2011.
2. Electronic Devices and Circuit Theory– R.L. Boylestad and Louis Nashelsky, Pearson Publications, Eleventh Edition, 2013.
3. Electronic Devices and Circuits – A.P. Godse and U.A. Bakshi, Technical Publications, First Edition, 2009.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Electro Magnetic Fields							

Course Objectives:

- To study the properties of materials, production of electric field and potentials due to different configurations of static charges and capacitance.
- To study the magnetic fields produced by currents in various configurations, application of ampere's law and Maxwell's 2nd and 3rd equations.
- To study the magnetic force and torque through Lorentz's force equation in magnetic field environment.
- To study the self and mutual inductances and the stored energy and study the time varying and Maxwell's equations in different forms.

Course Outcomes:

After completion of the course, the student should be able to

- Summarize the laws of Electrostatics and apply them in electrostatic field.
- Summarize the laws of Magneto statics and apply them in static magnetic field.
- Compute the force experienced by charged bodies in magnetic field and identify magnetic potential and its properties.
- Identify the time varying field and understand Faraday's Laws of Electromagnetic Induction.

UNIT-I: Electrostatics-I

A review of Co-Ordinate Systems-Electrostatic Fields - Coulomb's Law - Electric Field Intensity (EFI) - EFI due to a line, a Surface Charge and a circular loop - Work done in moving a Point charge in an electrostatic field - Electric Potential - Properties of Potential Function – Potential Gradient - Gauss's Law, Application of Gauss's Law- EFI due to a line, a Surface Charge and a circular loop. Maxwell's first equation div (D) = ρv, div(E)=ρ/ϵo Laplace's and Poisson's Equations - Solution of Laplace's Equation in one variable, simple cases only.

UNIT-II: Electrostatics-II

Electric dipole - Dipole Moment - Potential and EFI due to an electric dipole - Behaviour of conductors in an electric field - Conductors and Insulators. Electric field inside dielectric material – Polarization-Dielectric - Conductor and Dielectric - Dielectric Boundary Conditions, Capacitance - Capacitance of Parallel Plate, Spherical and co axial capacitors with composite dielectrics -Energy Stored and Energy Density in a Static Electric field - Current Density - Conduction and Convection Current densities - Ohm's law in point form - Equation of Continuity.

UNIT-III: Magnetostatics

Static Magnetic fields Biot-Savart Law - Magnetic Field Intensity (MFI) - MFI due to circular and solenoid current carrying wire - Relation between magnetic flux, magnetic flux density and MFI - Maxwell's 2ndEquation div(B)=0 Ampere's Circuital Law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament - Field due to circular loop of wire-Point form of Ampere's Circuital Law - Maxwell's third Equation Curl(H) = J

UNIT-IV: Magnetic Potential

Scalar Magnetic Potential and its limitations - vector magnetic potential and its properties - vector magnetic potential due to simple configurations - Vector Poisson's equations. Self and Mutual Inductances - Mutual inductance between a straight long wire and square loop wire in the same plane - Energy stored and Energy Density in a magnetic field.

UNIT-V: Force in Magnetic Fields

Magnetic Force - Moving charges in Magnetic Field - Lorentz force Equation - Force on a current element in Magnetic field - Force on a straight and a long current carrying conductor in magnetic field - Force between two straight long and parallel current carrying conductors - Magnetic Dipole and Dipole Moment - a differential current loop as a magnetic dipole - Torque on a current loop placed in a magnetic field.

UNIT-VI: Time Varying Fields

Time Varying Fields - Faraday's Laws of Electromagnetic Induction - Its integral and Point Forms - Maxwell's 4thEquation curl(H)=-∂B/∂t- Statically and Dynamically Induced EMF's - Simple problems. Modification of Maxwell's equations for time varying fields – Displacement Current - Poynting Theorem

Text Books:

1. William H. Hayt& John. A.Buck, "Engineering Electromagnetics" 7th Edition 2006.Mc.Graw - Hill Companies.
2. Sadiku, "Electro Magnetic Fields", 4th Edition, Oxford Publications, 2009.

Reference Books:

1. D J Griffiths, "Introduction to Electro Dynamics", 2nd Edition, Prentice - Hall of India pvt. Ltd.
2. J.D. Kraus, "Electromagnetics", 4th Edition, Mc Graw-Hill Inc, 1992.
3. N.Narayana Rao, "Elements of Engineering Electromagnetic", Prentice - Hall of India Pvt. Ltd.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Fluid Mechanics and Prime Movers							

Course Outcomes:

At the end of this course student will be ability to

- Learn the concept of fluid and its properties, the basic laws of fluids
- Get the knowledge of fluid kinematics and dynamics to solve the problems.
- Understand the concept of flow through pipes.
- Understand the working of different kinds of pumps.
- Understand the working of different kinds of turbines.
- Understand the concepts of hydro power generation.

UNIT I: Fluid Statics

Dimensions and units: physical properties of fluids- specific gravity, viscosity, surface tension, vapour pressure and their influence on fluid motion- measurement of pressure- Piezometer, manometry.

UNIT II: Fluid Kinematics & Fluid Dynamics

FLUID KINEMATICS: stream line, path line and streak lines and stream tube, classification of flows – steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, and irrational flows. Equation of continuity for one dimensional flow;

FLUID DYNAMICS: Surface and body forces, Euler's and Bernoulli's equations for flow along a stream line, applications.

UNIT III: Closed Conduit Flow

Reynolds's experiment, Minor losses in pipes, pipes in series and pipes in parallel, Measurement of flow: Pitot tube, venturimeter and orifice meter.

UNIT IV: Impact of Jets and Pumps

Impact of jets: Impulse momentum equation, Impact of Jet on stationary and moving vanes both flat and curved.

Pumps: Types of pumps, Centrifugal pump: components, working principle, Multi staging.

UNIT V: Hydraulic Turbines

Classification of turbines; Working principle, Efficiency calculation and Design principles for Pelton Wheel, Francis and for Kaplan turbines

UNIT VI: Hydro Power

Components of Hydroelectric power plant: pumped storage systems, load curve, load factor, capacity factor, utilization factor, diversity factor, load duration curve.

Text Books:

1. Hydraulics & Fluid Mechanics by P.N. Modi and S.M. Seth, Standard Book House, New Delhi.
2. Fluid Mechanics & Hydraulic Machinery by R.K.Bansal, Lakshmi Publications.
3. Fluid Mechanics & Hydraulic Machinery by A.K.Jain, Khanna Publishers, Delhi.

Reference Books:

1. Fluid Mechanics, by Victor. L. Streeter, TMH Publishers.
2. Introduction to Fluid Mechanics by Edward .J. &Shaughnessy Jr., Oxford University Press, 2005.
3. Fluid Mechanics & Fluid power Engineering by Dr D.S. Kumar, Sk.Kataria and Sons Publishers.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Complex Variables and Statistical Methods							

Course Objectives:

The emphasis will be on gaining a geometric understanding of complex analytic functions as well as developing computational skills in employing the powerful tools of complex analysis for solving theoretical and applied problems. The fundamental concepts of probability and statistics to develop and understanding the role of statistics in engineering.

Course Outcomes:

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

- Apply mathematical reasoning and the theory of complex variables to solve theoretical and applied problems.
- Calculate fundamental concepts such as the cumulative distribution function, expectations, and distributions of random variables.
- Apply this knowledge to identify, maximum error and determination of sample size, Interval Estimation (Large sample and small sample), Bayesian Estimation, Tests of Hypothesis.

UNIT-I: Functions of a complex variable:

Complex function , Real and Imaginary parts of Complex function, Limit, Continuity and Derivative of complex function, Cauchy-Riemann equations, Analytic function, entire function, singular point, conjugate function, equations in polar form, Harmonic functions, Milne-Thomson method, Simple applications to flow problems.

UNIT-II: Integration and Series expansions:

Line integral of a complex function, Cauchy's theorem (only statement), Cauchy's Integral formula. Absolutely convergent and uniformly convergent of series of complex terms, Radius of convergence, Taylor' series, Maclaurin's series expansion, Laurent's series.

UNIT-III: Integration using Residues:

Zeros of an analytic function, Singularity, Isolated singularity, Removable singularity, Essential singularity, pole of order m, simple pole, Residues, Residue theorem, Calculation of residues, Residue at a pole of order m, Evaluation of real definite integrals: Integration around the unit circle, Integration around semi-circle, Indenting the contours having poles on the real axis.

UNIT-IV: Probability, Random Variables, Discrete Distributions:

Review of basic concepts in Probability and Discrete Random variables, Continuous Random variables - Probability density, Distribution. Calculating probabilities from probability density, Binomial Distribution and Poission Distribution, Determining Mean and Variance of BD and PD.

UNIT-V: Continuous Distributions:

Normal Distribution- Properties. Calculating Normal Probabilities, Normal Approximation to Binomial Distribution, Uniform Distribution. The Exponential Distribution, Gamma Distribution, Beta Distribution and Weibul Distribution.

UNIT-VI: Sampling Distributions:

Population and sample, Sampling distribution of the mean(s known), Central Limit theorem (without Proof) and Problems, Sampling distribution of the mean(s unknown), Point Estimation, Maximum error and determination of sample size, Interval Estimation (Large sample and small sample),Sampling distribution of sums and differences.

Text Books:

1. B.S.Grewal, “Higher Engineering Mathematics”, 42nd Edition, Khanna Publishers,2012.
2. Miller and John E.Freund, “Probability and Statistics for Engineers”, Seventh edition, Pearson education, Prentice Hall of India,2005.

References Books:

1. Kreyszig E, "Advanced Engineering Mathematics", 8th Edition. John Wiley, Singapore, 2001.
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rd edition, Pearson, 2004.
3. S.C. Gupta and V.K. Kapoor, “Fundamentals of Mathematical Statistics”, Ninth Revised Edition, Sultan Chand & Sons Educational Publishers, 2007.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Electrical Machines-I							

Course Objectives:

- To understand the principle of operation and constructional features of DC generators.
- To study the characteristics and performance of DC generators.
- To learn the performance and starting methods of DC motors.
- To impart knowledge on testing methods of DC machines.
- To study the concept of operation and performance of single phase transformers.

Course Outcomes:

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

- Understand the unifying principles of electromagnetic energy conversion.
- Understand the construction, principle of operation and performance of DC machines.
- Learn the characteristics, performance, methods of speed control and testing methods of DC motors.
- To predetermine the performance of single phase transformers with equivalent circuit models.
- Understand the methods of testing of single-phase transformer.
- Analyze the three phase transformers and achieve three phase to two phase conversion.

UNIT - I: D.C. Generators - I

Principles of electromechanical energy conversion, singly excited and multi excited system - Principle of operation of DC Generator - E.M.F equation- armature windings - Constructional Features – armature reaction - cross magnetizing and de-magnetizing AT/pole – commutation process - methods of improving commutation: Resistance commutation, Voltage commutation and Compensating windings- Types of generators - self excited and separately excited: Shunt, Series and Compound.

UNIT - II: D.C. Generators - II

Open circuit characteristics - critical field resistance - critical speed - causes for failure to self-excitation - remedial measures - Internal and external characteristics of separately excited, shunt, series & compound generators-applications, losses and efficiency. Need for parallel operation - Parallel operation of DC Shunt and Compound generators.

UNIT - III: DC Motors

Principle of operation - back E.M.F - torque equation - types of motors - losses and efficiency-speed-torque characteristics - applications of dc motors. Starting of motors by 3 point and 4 point starters - Speed control methods - Testing of DC machines - Brake test, Swinburne's test - principle of regenerative or Hopkinson's test - Retardation test.

UNIT-IV: Transformers - I

Constructional details of core and shell type transformers - principle of operation - emf equation - operation on no load and on load - phasor diagrams of transformers at Lagging, Leading & Unity power factors - voltage regulation - losses and efficiency - effect of variation of frequency and supply voltage on losses - All day efficiency.

UNIT-V: Transformers - II

Testing on transformers: Polarity test - open circuit and short circuit tests - equivalent circuit

- Sumpner's test - Parallel operation with equal voltage ratios - auto transformer - comparison of three winding transformers with two winding transformers.

UNIT-VI: Transformers - III

Constructional details of three phase transformer - Polyphase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ and Scott connection - Third harmonics in phase voltages - determination of Z_p, Z_s and Z_t in three winding transformer - off load and on load tap changers.

Text Books:

1. Electrical Machines - P.S. Bhimbra, Khanna Publishers.
2. Electrical Machines by D P.Kothari, I .J .Nagarth, Mc GrawHill Publications, 4th edition.

Reference Books:

1. Electrical Machines by R.K. Rajput, Lakshmi publications, 5th edition.
2. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria & Sons.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
Electrical Circuits Lab							

Course Objectives:

- To learn the methods used for verification of circuit theorems.
- To study the concepts of resonance in series and parallel circuits.
- To understand the measurement of active and reactive power in a three-phase system
- To conduct experiment to calculate network parameters
- To learn the measurement of inductance of a mutually coupled coil.

Course Outcomes:

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

- Become familiar with the basic circuit components and know how to connect them to make a real electrical circuit.
- Become familiar with basic electrical measurement instruments and know how to use them to make different types of measurements.
- Verify the laws and principles of electrical circuits, understand the relationships and differences between theory and practice.
- Gain practical experience related to electrical circuits, stimulate more interest and motivation for further studies of electrical circuits.

Any 10 of the following experiments to be conducted:

1. Verification of Kirchhoff's laws.
2. Verification of Thevenin's and Norton's Theorems.
3. Verification of Superposition theorem.
4. Verification of Maximum Power Transfer Theorem.
5. Verification of Reciprocity Theorem.
6. Verification of Millmann's Theorem.
7. Verification of Compensation Theorem.
8. Verification of Telligen's Theorem.
9. Series and Parallel Resonance of a RLC circuit.
10. Determination of Self, Mutual Inductances and Coefficient of coupling.
11. Z and Y Parameters of a Two-Port Network.
12. Transmission and hybrid parameters of a Two-Port Network.
13. Measurement of Active Power for Star and Delta connected balanced loads.
14. Measurement of Reactive Power for Star and Delta connected balanced loads.
15. Measurement of 3-phase Power by two wattmeter method for unbalanced loads.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
Electronic Devices and Circuits Lab							

Course Objective:
This lab course is intended to know the usage of electrical and electronics equipment, understand the characteristics of PN junction diode, transistor, and amplifiers.

Course Outcomes:
After the completion of this course the student will be able to

- Understand and analyze the behavior of electronic circuits.
- Understand the characteristics of various semiconductor devices like BJT, FET, UJT.
- Design transistor & FET amplifier circuits.

LIST OF EXPERIMENTS:
(For Laboratory Examination-Minimum of Ten Experiments)

1. P-N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias& Reverse bias) Part B: Silicon Diode (Forward Bias only)
2. Zener Diode
   Characteristics Part A: V-I Characteristics
   Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter) Part A: Half-wave Rectifier Part B: Full-wave Rectifier
4. BJT Characteristics (CE Configuration) Part A: Input Characteristics
   Part B: Output Characteristics
5. FET Characteristics (CS Configuration) Part A: Drain Characteristics
   Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

Equipment required for Laboratory

1. Breadboard Trainers.
2. Ammeters (Analog or Digital).
3. Voltmeters (Analog or Digital).
4. Regulated Power Supplies.
5. Analog/Digital Storage Oscilloscopes.
6. Analog/Digital Function Generators.
7. Digital Multimeters.

8. Decade Résistance Boxes/Rheostats.
9. Decade Capacitance Boxes.
10. Cathode Ray Oscilloscopes.

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	-	-	-	-
Verbal Ability							

Course Objectives:

- To make students understand the usage of words, relationships; the alternatives and their meanings
- To give fair idea about understanding and comprehension skills
- To make students analyze arguments and draw logical conclusions
- To help students overcome the problems in using English through remedial grammar

Course Outcomes:

At the end of the course Students will be able to

- Use appropriate words effectively in their communication
- Identify and correct Grammar and vocabulary related errors
- Construct the sentences effectively using appropriate verbal reasoning abilities
- Demonstrate understanding and comprehensive skills
- To clear written test in campus placements as well as various competitive exams.

Teaching Methodology:

The methodology of teaching will be chalk & talk, Ppt., Audio-Visual and activity based.

No. of Periods per Unit	8	No. of tutorial periods	1

Unit-I: Vocabulary Building
(Direct links to content used from the web page:

a. http://grammar.ccc.commnet.edu/grammar/vocabulary.htm
b. http://www.enhancemyvocabulary.com/
c. http://celi.olemiss.edu/wp-content/uploads/sites/7/2014/01/StrategiesVocabulary- 80808.pdf

Unit-II: Sentence construction
(Direct links to content used from the web page:

a. http://www.learnenglish.de/grammar/sentencetext.html
b. http://www.bbc.co.uk/skillswise/factsheet/en30stru-l1-f-rules-and-egs-to-help-you- make-a-sentence
c. http://www.dummies.com/how-to/education-languages/language-arts/Grammar- usage/Sentence-Construction.html
d. https://www.liberty.edu/media/2030/Sentence_Construction.pdf
e. http://www2.isu.edu/success/writing/handouts/sent-structure.pdf

Unit-III: English Usage and Remedial Grammar (Direct links to content used from the web page:

a. http://ihecs-langues.be/remedial/grammar.htm
b. http://mdudde.net/books/BA/BA%20I%20year/English/ba-1st-engish-paperB.pdf
c. http://www.sakshieducation.com/Engg/EnggAcademia/CommonSubjects/English - GRAMMAR.pdf

Books with page numbers:

1. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007; Pg.No.2.233-2.236.
2. The Official Guide for GMAT Review, 11th edition, Blanche Brann LP, Lawrenceville NJ, Pg. No : 630 – 662.)

Unit-IV: Analogies and Reverse Analogies (Direct links to content used from the web page:

a. http://www.jagranjosh.com/articles/verbal-ability-analogies-and-reverse-analogies- questions-for-cat-1335522802-1
b. http://www.testprepreview.com/modules/analogies1.htm
c. http://www.gmat-pacer.com/gre-guidetc.html

Books with page numbers:

1. A Modern Approach to Verbal & Non – Verbal Reasoning by Dr. R.S. Aggarwal, 1994, S.Chand & Co, Pg. Nos 35-142.
2. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007, Pg. No's 2.95-2.103)

Unit-V: Reading Comprehension, Close Passage & Fill in the Blanks (Direct links to content used from the web page:

a. http://www.majortests.com/sat/reading-comprehension.php
b. http://cat.wordpandit.com/rc-passage-36/
c. http://www.mycatprep.com/FreepracticeQuestionsEnglish.html
d. http://www.lofoya.com/Verbal-Test-Questions-and-Answers/Reading-Comprehension/intro
e. http://mba.hitbullseye.com/free_mock_cat/Reading-Comprehension-CAT.php

Books with page numbers:

1. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007, Pg. No 1.11-1.99
2. The Official Guide for GMAT Review, 11th edition, Blanche Brann LP, Lawrenceville NJ, Pg. No's: 340-462.)

Unit-VI: Facts, Inferences & Judgments Books with page numbers:

1. A Modern Approach to Verbal & Non – Verbal Reasoning by Dr. R.S. Aggarwal, 1994, S.Chand & Co, Section-II Pg. No's: 1-224
2. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007, Pg. No's: 3.5 – 3.27; 3.63 – 3.64
3. The Official Guide for GMAT Review, 11th edition, Blanche Brann LP, Lawrenceville NJ, Pg. No 464-506.

No. of Periods for assessments for all units	2

References:

1. http://www.verbalreasoningtest.org/
2. https://www.bond11plus.co.uk/verbal-reasoning
3. http://www.studyguidezone.com/mcat_verbalreasoning.htm
4. http://www.varsitytutors.com/mcat_verbal-practice-tests
5. https://www.khanacademy.org/test-prep/mcat

Books

1. 30 Days to a More Powerful Vocabulary by Funk.
2. Practical English Usage by Michael Swan
3. Practice & Pass Professional: Verbal Reasoning Tests: Practice Questions and Expert Coaching to Help You Pass by Alan Redman
4. Kaplan MCAT Verbal Reasoning and Writing Review
5. The Verbal Reasoning Test Workbook: Unbeatable Practice for Verbal Ability by Mike Bryon
6. Understanding and Using English Grammar by Betty Schrampfer Azar.

II B.TECH II SEMESTER

II B.TECH. – II SEMESTER COURSE STRUCTURE

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Digital Electronics	PC	3	1	-	40	60	100	3
2	Control Systems	PC	3	1	-	40	60	100	3
3	Power Generation and Economic Aspects	PC	3	1	-	40	60	100	3
4	Electrical Machines-II	PC	3	1	-	40	60	100	3
5	Business Management Concepts for Engineers	HS	3	1	-	40	60	100	3
6	Analog Electronics	PC	3	1	-	40	60	100	3
7	Electrical Machines - I Lab	PC	-	-	3	25	50	75	2
8	Analog & Digital Circuits Lab	PC	-	-	3	25	50	75	2
9	Quantitative Aptitude and Reasoning-I	MC	3	-	-	-	-	-	-
	Total		21	6	6	290	460	750	22

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Digital Electronics							

Course Objectives:

- To study various number systems, error detecting and correcting binary codes, representation of switching functions using Boolean expressions and their minimization techniques.
- To study the combinational logic design and their realization.
- To study programmable logic devices and realization of switching functions.
- To study the sequential logic circuits design and their realization and also study the different digital logic families.

Course Outcomes:

After the completion of this course the student will be able to

- Aware of Boolean algebra & the underlying features of various number systems.
- Design various combinational logic circuits.
- Design and realize Boolean functions using PLDs.
- Analyze and design various sequential circuits and illustrate basic gates with TTL, ECL, MOS logic family.

UNIT – I: Number Systems and Logic Gates

Number systems, Complements, Signed binary numbers, Binary Arithmetic, Binary codes – BCD, Excess-3 code, Gray code, Error detecting and correcting code – Hamming code, Conversion. AND, OR, NOT, NAND, NOR, Exclusive –OR and Exclusive – NOR logic gates, NAND-NAND and NOR-NOR realizations, Realization of Boolean Functions using logic gates.

UNIT – II: Boolean Algebra

Boolean postulates – De-Morgan's Theorems, Principle of Duality, Minimization of Boolean expressions – Sum of Products (SOP) and Product of Sums (POS) - Minterm and Maxterm, Canonical forms – Conversion into canonical form –Karnaugh map Minimization (up to 5 variables) - Don't care conditions.

UNIT – III: Combinational Logic Circuits

Design procedure, Adders and Subtractors – Serial adder/Subtractor, Parallel adder/Subtractor-Carry look ahead adder, BCD adder, Comparator, Decoder, Encoder, Multiplexer, Demultiplexer, Parity Checker, Code converters.

UNIT – IV: Programmable Logic Device

PROM, PLA, PAL, Realization of switching functions using PROM, PLA and PAL, Comparison of PROM, PLA, and PAL, Programming tables of PROM, PLA and PAL.

UNIT – V: Sequential Logic Circuits

Latches, Flip flops - SR, JK, T, D and Master Slave, JK – Characteristic equations and Excitation tables, Modes of triggering – Edge and Level Triggering, Realization of one flip flop using other flip flops.

UNIT-VI: Registers & Counters

Registers and their operation, Synchronous and Asynchronous Counters, Modulo–N Counters.

Text Books:

1. Switching Theory and Logic Design – A. Anand Kumar, Prentice-Hall of India Pvt.Ltd, Second Edition, 2014.
2. Pulse, Digital and Switching Waveforms – J. Millman, H. Taub and Mothiki S. PrakashRao, Tata McGraw-Hill, Second Edition, 2008.
3. Digital Design – M. Morris Mano, PHI, Fourth Edition, 2008.

Reference Books:

1. Modern Digital Electronics - R.P. Jain, TMH, Fourth Edition, 2009.
2. Pulse and Digital Circuits – A. Anand Kumar, PHI, Second Edition, 2005.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Control Systems							

Course Objectives:

- To Describe feedback control and basic components of control systems
- To understand the various time domain and frequency domain tools for analysis and design of linear control systems
- To study the methods to analyze the stability of systems from transfer function forms
- To describe the methods of designing

Course Outcomes:

On completion of this course, the student will be able to

- Develop a mathematical model of electrical and physical system.
- Analyze the electrical and mechanical analysis in time and frequency domains.
- Examine stability analysis techniques with appropriate compensators.

UNIT - I: Mathematical Modeling of Control Systems

Open Loop and closed loop control systems and their differences, Classification of control systems, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems, Transfer Function of DC Servo motor and AC servo motor - Synchro-transmitter and Receiver, Block diagram algebra - Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-II: Time Response Analysis

Standard test signals - Time response of first order systems -Time response of second order systems - Time domain specifications - Steady state error and error constants - Effects of proportional derivative, proportional integral systems & proportional integral and derivative systems

UNIT - III: Stability and Root locus Technique

The concept of stability -Routh's stability criterion - limitations of Routh's stability - The root locus concept - construction of root loci (Simple problems), Effect of Addition of poles and Zeros on Root locus

UNIT - IV: Frequency Response Analysis

Introduction, Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, and Nyquist Stability criterion.

UNIT - V: Classical Control Design Techniques

Lag, Lead, Lag-Lead compensators, design of compensators -using Bode plots.

UNIT - VI: State Space Analysis of Continuous Systems

Concepts of state, state variables and state model, state space representation of transfer function, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties - Concepts of Controllability and Observability.

Text Books:

1. Control Systems Engineering by I.J.Nagarath and M.Gopal, New Age InternationalPublishers.
2. Automatic control systems, Benjamin C. Kuo, Prentice Hall of India,2nd Edition.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems principles and design, M.Gopal, Tata Mc Graw Hill education Pvt Ltd.,4th Edition.
3. Control Systems Engineering, S. Palani, Tata Mc Graw Hill Publications.
4. Control Systems, ManikDhanesh N, Cengage publications.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Power Generation and Economic Aspects							

Course objectives:

- To study the principle of operation of different components of a thermal power stations.
- To study the principle of operation of different components of a Nuclear power stations.
- To study the concepts of DC/AC distribution systems and voltage drop calculations.
- To study the constructional and operation of different components of an Air and Gas Insulated substations.
- To study the constructional details of different types of cables.
- To study different types of load curves and tariffs applicable to consumers.

Course Outcomes:

The student should be able to

- Identify the different components of thermal power plants.
- Identify the different components of nuclear Power plants.
- Distinguish between AC/DC distribution systems and also estimate voltage drops of distribution systems.
- Identify the different components of air and gas insulated substations.
- Identify single core and three core cables with different insulating materials.
- Analyse the different economic factors of power generation and tariffs

UNIT-I Thermal Power Stations

Selection of site, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: boilers, super heaters, economizers, electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

UNIT-II Nuclear Power Stations

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

UNIT-III Economic Aspects of Power Generation & Tariff

Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, base and peak load plants.

Tariff Methods– costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods.

UNIT-IV Substations

Classification of substations:

Air Insulated Substations– indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment.

Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and

transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, constructional aspects of GIS, installation and maintenance of GIS, comparison of air insulated substations and gas insulated substations.

UNIT-V Underground Cables

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables: Grading of cables – capacitance grading and inter sheath grading.

UNIT-VI Distribution Systems

Classification of distribution systems, design features of distribution systems, radial distribution, ring main distribution, voltage drop calculations: DC distributors for following cases - radial DC distributor fed at one end and at both ends (equal / unequal voltages), ring main distributor, stepped distributor and AC distribution, comparison of DC and AC distribution.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagarand A. Chakrabarti, DhanpatRai& Co. Pvt. Ltd.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New Age International (P) Limited, Publishers.

Reference Books:

1. Electrical Power Distribution Systems by V. Kamaraju, Tata Mc Graw Hill, New Delhi.
2. Elements of Electrical Power Station Design by M V Deshpande, PHI, New Delhi.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Electrical Machines-II							

Course Objectives:

- To familiarize the students with the constructional details, working principles, operating characteristics of poly phase induction machines.
- To let the students to know the constructional details, working principles, operation of synchronous generators and synchronous motors.
- To study the operation of single phase induction motor, reasons for it's no self-starting character and applications.

Course Outcomes:

Upon completion of the course the student can able to know

- Working of induction motors and its characteristics.
- Performance test on the induction motor to find the losses, efficiency.
- Speed control techniques of induction motors for industry requirements.
- Working of synchronous generator, Calculation of voltage regulation and how to synchronize it with grid.
- Applications of synchronous motors and differences between the induction motor and synchronous motor.

UNIT-I: Three phase induction motor – I

Construction details and principle of operation induction motors – slip – rotor emf & rotor frequency- equivalent circuit - phasor diagram – relation between rotor input, rotor losses and mechanical power developed - torque-slip characteristics – losses and efficiency - no load and blocked rotor test - circle diagram

UNIT- II: Three phase induction motor – II

Starting of Induction motors – types of starters – DOL starter, rotor resistance, star-delta starter & auto transformer – speed control – voltage control, frequency control – cogging and crawling – double cage induction motors – Induction generator.

UNIT-III: Synchronous Generators - I

Constructional features of non-salient and salient pole type synchronous machines- Armature windings – winding factors - EMF equation – Phasor diagram –Single phase Armature reaction – Rotating magnetic fields - synchronous reactance - load characteristics.

UNIT-IV: Synchronous Generators - II

Voltage regulation - predetermination of regulation by synchronous impedance method (EMF) Ampere turns method (MMF) and Potier triangle method (ZPF) - Two reaction theory of salient pole machines – determination of Xd and Xq- Parallel operation- load sharing– effect of change of excitation and numerical problems.

UNIT-V: Synchronous motors

Principle of operation of Synchronous motor – Phasor diagram- Operation of Synchronous motor on infinite bus bar – 'V' and inverted 'V' curves – Equations for power developed and power input – starting methods – Hunting of Synchronous motors and its suppression - synchronous condenser.

UNIT-VI: Single phase induction motors

Constructional details of Single phase induction motor-Double revolving field theory and operation–Equivalent circuit - performance analysis – Starting methods.

Text books:

1. D.P.Kothariand I.J.Nagrath,"Electric Machines", Tata McGraw-Hill Publications 4th edition
2. Electrical Machinery - P.S. Bhimbra, Khanna Publishers, 2003.

Reference books:

1. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria& Sons.
2. Electrical Machine Design by A.K. Sawhney, Dhanpat Rai & Sons publications.
3. Alexander S.Langsdorf,"Theory of Alternating current machinery", Tata McGraw Hill
4. Theory of Alternating Current Machinery- Langsdorf, Tata McGraw-Hill

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Business Management Concepts for Engineers							

Course Objective:
To equip the student with the fundamental knowledge relating to economic principles, management concepts fundamentals of the accounting.

Course Outcome:

- The outcome of this program is that the student learns necessary skills relating tothe economics, management and accountancy which are useful for decision making.
- This course helps the student to equip themselves with the basic principles of accounting which will be of help to them to know the fundamentals of accounting.
- The student will also acquire necessary skills relating to various functional aspects of management viz., Human Resource Management, Marketing Management etc.
- This course will also help the student to acquaint with the latest management concepts and practices which are used in the industry.

UNIT-I Introduction to Managerial Economics
Definitions, - Nature And Scope- Relation With Other Subjects- Demand Definition- Determinants- Law of Demand and Its Exceptions- Concept of Elasticity of Demand- Demand Forecasting Techniques.

UNIT-II Theory of Production and Cost Analysis:
Production Function- Law of Variable Proportions- Economies of Scale- Cost Concepts- CVP Analysis (With Simple Problems)- Significance- Limitations- Introduction to Markets – Features of various markets-Perfect competition, Monopoly and Oligopoly.

UNIT-III Introduction to Financial Accounting
Definition-GAAP principles- types of accounting- Double Entry System- Journal Entries – Ledger- Trial Balance- Income statement-Balance sheet-Final Accounts with Simple Adjustments.

UNIT-IV Introduction to Management
Concept, Nature, Importance- Functions of Management- Henry Fayols Principles of Management - F.W.Taylors Scientific Management- Douglas Mc Gregors Theory X and Y- Challenges of Management.

UNIT-V Functional Areas of Management (1)
Concept of HRM, Functions of HR Manager- Marketing Management- Functions of Marketing Manager-Production Management-Functions of Production Management – Methods of Production - Job Production, Batch Production and Mass Production – Method Study-Inventory Management- ABC Analysis – EOQ Analysis

UNIT-VI Functional Areas of Management (2):
Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM- Problems on Critical Path- Problems on PERT Analysis- Financial Management- Concepts of Capital –Working Capital- Capital Budgeting- Functions of Financial Management.

Text Books:

1. Dr.N.APPARAO Dr. P. Vijay Kumar: "Managerial economics and financial analysis" Cengagepublication's, New Delhi-2011.
2. Dr. A.R.Aryasri- Managerial Economics and Financial Analysis, TMH2011.
3. Dr. P. Vijaya Kumar & Dr. N.Appa Rao," Managerial Science" cengage. Delhi,2012.

References Books:

1. V. Maheswari: Managerial Economies, Sultan Chand.
2. Suma Damodaran: Managerial Economics, Oxford 2011.
3. Koontz &Weihrich: Essentials of Management" TMH 2011.
4. Hitt and Vijaya Kumar: Strategic Management, cengage learning.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Analog Electronics							

Course Objectives:

- Design and understand the operation of analog electronics circuits such as feedback amplifiers, Operational Amplifiers and its applications.
- Understand the operation of Linear, Non-Linear wave shaping circuits and its applications
- Compare the working of multivibrators using op-amp, IC 555and the operation of different oscillators.
- Understand the operation of the most commonly used D/A and A/D converters.

Course Outcomes:

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

- Understand and design the operation of feedback amplifiers.
- Understand different wave shaping circuits and design basic op-amp circuits.
- Design different multivibrators using op-amp and 555 timers, different oscillators.
- Know about different D/A and A/D converters.

UNIT - I: Feedback Amplifiers

Feedback principle and concept, Types of feedback, Classification of amplifiers- Voltage amplifier, Current amplifier, Trans conductance amplifier, Trans resistance amplifier, Feedback topologies, Characteristics of negative feedback amplifiers, General analysis of feedback amplifiers-input resistance and output resistance, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers, Analysis feedback amplifier- Voltage series feedback, Current shunt feedback.

UNIT - II: Linear and Non-Linear Wave Shaping

Linear Wave Shaping: The high pass and low pass RC circuits: Sinusoidal input, Step input, Pulse input, Square and Ramp input, RC network as a differentiator and an integrator.

Non-Linear Wave Shaping: Diode and its characteristics, Diode series clippers, Diode parallel clippers, Two level clipping circuits and Emitter coupled clipper, Clamping operation, Clamping circuits using diode with different inputs.

UNIT - III: Operational Amplifier and its Applications

Different stages of Operational Amplifier: Differential Amplifier, Ideal and practical Op- Amp. Characteristics of OP-Amps, DC and AC characteristics, Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, V to I and I to V converters, Comparators, Log and Anti log amplifiers.

UNIT - IV: Multivibrators, Timers and Oscillators

Multivibrators: Monostable, (Bistable), Astable multivibrators using Op-amp.

Timers: Introduction to 555 timer, Functional diagram, Monostable and Astable operation using 555 timer and its applications.

Oscillators: RC phase shift oscillator and Wien bridge oscillator using Op-amp.

UNIT - V: Active Filters

Introduction– Merits and demerits of active filters over passive filters– 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and All pass filters.

UNIT - VI: D/A And A/D Converters

Introduction, Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, Inverted R- 2R DAC, Different types of ADCs - Parallel comparator type ADC, Counter type ADC, Successive approximation ADC and Dual slope ADC.

Text Books:

1. Integrated Electronics- Jacob Millman, C. Halkies, C.D. Parikh, SatyabrataJit, Tata McGraw-Hill, Second Edition, 2011.
2. Linear Integrated Circuits - D. Roy Chowdhury, New Age International Pvt Ltd, Second Edition,2003.
3. Pulse, Digital and Switching Waveforms – J. Millman, H. Taub and Mothiki S. Prakash Rao, Tata McGraw-Hill, Second Edition, 2008.

Reference Books:

1. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, Pearson Education, Fourth Edition, 2015.
2. Electronic Devices and Circuit Theory– R.L. Boylestad and Louis Nashelsky, Pearson Publications, Eleventh Edition, 2013.
3. Operational Amplifiers with Linear Integrated Circuits–William D. Stanley, Pearson Education India, Fourth Edition, 2002.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
Electrical Machines-I Lab							

Course Objective:

- To obtain the characteristics of DC motors and generators by performing brake tests and load tests respectively.
- To determine the losses and efficiencies of a DC Machine
- To know the performance and speed control of DC Machines

Course Outcomes:

After completion of this course student can able to

- Calculate the critical field resistance and critical speed of DC Generator
- Predetermine the efficiency of a given DC Shunt machine working as Motor and Generator.
- Analyse the characteristics of DC Motors and Generators.
- Evaluate efficiencies of DC Series and Shunt generators

Any 10 of the following experiments are to be conducted:

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Load test on DC series generator. Determination of characteristics
4. Load test on DC compound generator. Determination of characteristics.
5. Brake test on DC compound motor. Determination of performance curves.
6. Brake test on DC shunt motor. Determination of performance curves.
7. Speed control of DC shunt motor by armature and field control methods.
8. Hopkinson's test on DC shunts machines. Predetermination of efficiency.
9. Fields test on DC series machines. Determination of efficiency.
10. Swinburne's test and Predetermination of efficiencies as Generator and Motor.
11. Retardation test on DC shunt motor. Determination of losses at rated speed.
12. Separation of losses in DC shunts motor.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
Analog & Digital Circuits Lab							

Course Objective:

This lab course is intended to know the use and design of Logical gates, Flip-Flops, Op-Amp, power amplifiers, multivibrator circuits using IC 555 and voltage regulators.

Course Outcomes:

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

- Understand the realization of logic gates and Flip-Flops.
- Design and analyze clippers, Clampers and also implement the applications using op-amps.
- Design of multivibrator using 555 IC timers and Schmitt trigger circuit using op-amp.

List of Experiments:

1. Realization of logic gates.
2. Representation of logic gates with universal gates.
3. Verification of SR and JK Flip Flops operation.
4. Linear wave shaping-low pass and high pass circuits.
5. Nonlinear wave shaping-clippers and clampers circuits.
6. Realization of adder, subtractor, and comparator circuits using Op-amp.
7. Designing LPF, HPF (first order) using Op-amp.
8. Designing Differentiator and Integrator using Op-amp.
9. Designing Monostable and Astable operation circuits using IC 555 timer.
10. Designing RC Phase shift oscillator using Op-amp.
11. Design of half adder, full adder and half subtractor.
12. Design of Schmitt trigger using Op-amp.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	-	-	-	-
Quantitative Aptitude and Reasoning - I							

Course Objectives:

- To train students in analysing real life scenarios considering all factors
- To educate the students on principles of mathematical problems and problem solving methods
- To train students for campus placements

Course Outcomes:

After thorough learning of Quantitative Aptitude and Reasoning, a student:

- Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements
- Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.
- Will be able to demonstrate various principles involved in solving mathematical
- Problems and thereby reducing the time taken for performing job functions.

Unit I: Simple equations, Ratio, Proportion, Variation, Percentages

1. **Simple equations**
   a. Definition of Linear Equations
   b. Formation of simple equations
   c. Problems on Ages, Fractions and Digits
   d. Indeterminate system of equations
   e. Special cases in indeterminate system of equations
2. **Ratio and proportion**
   a. Definition of Ratio
   b. Properties of Ratios
   c. Comparison of Ratios
   d. Problems on Ratios
   e. Compound Ratio
   f. Problems on Proportion, Mean proportional and Continued Proportion.
3. **Variation**
   a. Direct variation
   b. Inverse variation
   c. Joint variation
   d. Problems on Variations

Unit II: Percentages, Profit and loss, Partnership, Simple interest and Compound Interest, Quadratic equations, Progressions

1. **Percentages**
   a. Introduction
   b. Converting a percentage into decimals
   c. Converting a Decimal into a percentage
   d. Percentage equivalent of fractions
   e. Problems on percentages
2. **Profit And Loss**
   a. Problems on Profit and Loss percentage
   b. Relation between Cost Price and Selling price
   c. Discount and Marked Price

d. Two different articles sold at same Cost Price
e. Two different articles sold at same Selling Price
f. Gain% / Loss% on Selling Price

3. **Partnership**
   a. Introduction
   b. Relation between capitals, Period of investments and Shares
4. **Simple Interest**
   a. Definitions
   b. Problems on interest and amount
   c. Problems when rate of interest and time period are numerically equal.
5. **Compound Interest**
   a. Definition and formula for amount in compound interest
   b. Difference between simple interest and compound interest for 2 years on the same principle and time period.
6. **Quadratic equations**
   a. General form of Quadratic equations
   b. Finding the roots of Quadratic equations
   c. Nature of the roots
   d. Relation between the roots
   e. Maximum and minimum value of Quadratic Expression
7. **Progressions**
   a. Arithmetic Progression
   b. Geometric Progression
   c. Harmonic Progression
   d. Arithmetic Mean, Geometric Mean and Harmonic Mean and their relation.

UNIT III: Deductions & Connectives

1. **Deductions**
   a. Finding the conclusions using Venn diagram method
   b. Finding the conclusions using syllogism method
2. **Connectives**
   a. Definition of a simple statement
   b. Definition of compound statement
   c. Finding the Implications for compound statements
   d. Finding the Negations for compound statements

UNIT IV: Analytical Reasoning puzzles

a. Problems on Linear arrangement
b. Problems on Circular arrangement
c. Problems on Double line-up
d. Problems on Selections
e. Problems on Comparisons

UNIT IV: Clocks, Calendars & Blood relations

1. **Clocks**
   a. Finding the angle when the time is given
   b. Finding the time when the angle is known
   c. Relation between Angle, Minutes and Hours
   d. Exceptional cases in clocks
2. **Calendars**
   a. Definition of a Leap Year
   b. Finding the number of Odd days
   c. Framing the year code for centuries

d. Finding the day of any random calendar date

3. **Blood relations**
   a. Defining the various relations among the members of a family
   b. Solving Blood Relation puzzles
   c. Solving the problems on Blood Relations using symbols and notations

Text Books:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, 'Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude - AbhijitGuha Mc Graw Hills

References:

1. www.careerbless.com/aptitude/qa/home.php
2. www.affairscloud.com/quantitative-aptitude-questions
3. www.careerafter.com/rs-aggarwal-quantitative-aptitude-pdf/
4. www.amazon.in/Quantitative-Aptitude-Competitive-Examinations.../8121924987
5. www.indiabix.com
6. www.practiceaptitudetests.com/numerical-reasoning-tests

III B.TECH I SEMESTER

III B.TECH. - I SEMESTER COURSE SEMESTER

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Power System Transmission Lines	PC	3	1	-	40	60	100	3
2	Power Electronics	PC	3	1	-	40	60	100	3
3	Electrical Measurements	PC	3	1	-	40	60	100	3
4	Microprocessor & Microcontrollers	PC	3	1	-	40	60	100	3
5	Signals and Systems	PC	3	1	-	40	60	100	3
6	**Professional Elective - I** 1.Renewable Energy Sources 4.Electrical Machine Design 5. Micro Electro Mechanical Systems 4.Industrial Instrumentation	PE	3	1	-	40	60	100	3
7	Control Systems and Measurements Laboratory	PC	-	-	3	25	50	75	2
8	Electrical Machines - II Laboratory	PC	-	-	3	25	50	75	2
9	Mini Project – I	PW	-	-	-	25	50	75	1
10	Advanced Communication Skills	MC	2	-	-	-	-	-	-
11	Sports and Games	MC		-	3	-	-	-	-
	Total		20	6	9	315	510	825	23

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER SYSTEM TRANSMISSION LINES							

Course Objectives:

1. To introduce the transmission line parameters and methods for calculation of line parameters for the single phase and three phase circuits.
2. To study performance of short, medium and long transmission lines
3. To study power system transients and various factors governing the transmission lines
4. To study mechanical design of transmission lines and overhead insulators

Course Outcomes:

After completion of this course, Students will be able to

1. Apply the knowledge of mathematics for deriving the inductance and capacitance for various conductor configurations and to find ABCD constants for different transmission lines.
2. Find efficiency and regulation of different transmission lines.
3. Analyze the factors affecting the power loss due to corona and suggest methods to minimize the corona loss.
4. Classify the insulators used in power transmission and distribution system.
5. Analyze the different waves and transients in power systems.
6. Calculate Sag and Tension in Transmission lines.

UNIT-I: Transmission Line Parameters

Introduction-Types of conductors-Bundled conductors - Skin and Proximity effects - Description and effect on Resistance of Solid Conductors- inductance of single phase two- wire system with composite conductors - inductance of three-phase lines: Equivalent(Symmetrical) Spacing, Unsymmetrical Spacing (Untransposed & Transposed), Inductance of three-phase double circuit line, Numerical Problems, Capacitance of a Single phase line &Three-phase lines, Capacitance of a Three-Phase double circuit line, Numerical Problems, Effect of Earth on Transmission line Capacitance.

UNIT-II: Performance of Short and Medium Transmission Lines

Introduction, Classification of Transmission Lines –Short Transmission line: A, B, C, D constants-efficiency and regulation – Medium Transmission line: Load End Capacitance Method, Nominal-T, And Nominal-π, A, B, C, D Constants- efficiency and regulation-Numerical Problems.

UNIT-III: Performance of Long Transmission Lines

Introduction - Rigorous Solution- Interpretation of the Long Line equations - Evaluation of A, B, C, D constants-Ferranti effect – Charging Current – Efficiency & Regulation- Equivalent-T and Equivalent π network models. Surge Impedance and SIL of Long Lines- Numerical Problems.

UNIT-IV: Power System Transients

Introduction, Transients in simple circuits – Travelling waves on transmission lines – Open Circuited Line–Short Circuited Line – Line terminated through a resistance- Line connected to a cable- Reflection and Refraction at T-Junction– Line terminated through a capacitance-Attenuation of Travelling waves-Numerical Problems.

UNIT-V: Various Factors Governing the Performance of Transmission line

Power factor Improvement- causes , effects of low power factor-Advantages-Methods of power factor Improvement-Shunt Capacitor, Synchronous Condenser – Voltage control – Concepts of voltage control Methods –Corona – Description of the phenomenon–Factors affecting corona– Methods to decrease corona loss –Radio Interference-Numerical Problems.

UNIT -VI: Mechanical design of transmission lines & Overhead Line Insulators

Introduction- Sag and Tension calculations with equal and unequal heights of towers- effect of Wind and Ice loading- numerical Problems - Stringing chart and sag template. Types of Insulators-Potential distribution over a string of suspension insulators-calculation of string efficiency- Methods of equalizing the potential- Numerical Problems.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, DhanpatRai& Co Pvt.Ltd.
2. Electrical power systems by C.L.Wadhwa, New Age International (P) Limited, Publishers.
3. Power System Analysis by John J Grainger and William D Stevenson Jr. McGrawHill

Reference Books:

1. Electric Power Transmission and Distribution by S.Sivanagaraju&S.Satyanarayana.
2. A course in Electrical Power systems by J.B. Gupta, KatariaPublications
3. Electrical power systems by Dr.S.L.Uppal, Khannapublishers.

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER ELECTRONICS							

Course Objectives:

1. To study the characteristics of various power semiconductor devices like BJT, MOSFET, and IGBT &SCR.
2. To study the operation of 1-Ø &3-Ø AC-DC Converters and their analysis.
3. To study the operation of AC-AC and DC-DC Converters like AC Voltage regulators, Cyclo converters &Choppers
4. To understand the working of inverters and application of PWM techniques for voltage control and harmonic mitigation.

Course Outcomes:

After completion of this course, Students will be able to

1. Explain the characteristics of various power semiconductor devices like BJT, MOSFET, and IGBT &SCR.
2. Identify the operation of Half–wave & full–wave converters and their comparisons.
3. Identify the operation of three phase full–wave converters and dual converter.
4. Demonstrate the operation of single phase AC Voltage converters & Cyclo converters and their comparisons.
5. Summarize the various DC-DC converters and four-quadrant operation of chopper clearly.
6. Explain the working of inverters and make use of PWM techniques for voltage control and harmonic mitigation.

UNIT–I: Power Semi-Conductor Devices

Thyristors–Silicon controlled rectifiers (SCR's) - Characteristics of power BJT, MOSFET and IGBT - Basic theory of operation of SCR - Firing circuits - Static characteristics - Turn on and turn off methods - Dynamic characteristics of SCR - Snubber circuit - Series & Parallel connections of Thyristors-Numerical problems.

UNIT–II: AC-DC Converters (Single-Phase)

Half wave converters with R, RL, and RLE loads– Derivation of average load voltage and current–Effect of freewheeling diode for RL load. Semi Converters (Half Controlled): Operation with R, RL loads –Applications. Full Converters: Operation with R, RL and RLE loads–Derivation of average voltage and current – Effect of source Inductance- Numerical problem-Dual Converter.

UNIT–III: AC–DC Converters (Three-Phase)

Full converter with R and RL loads–Semi converter (Half Controlled) with R and RL loads–Derivation of load voltage–Line commutated Inverter operation–Dual converters with non–circulating and circulating modes of currents. Effect of Source of inductance on Three-Phase Converter - Numerical problems.

UNIT - IV: AC–AC Converters

AC Voltage Controllers: Phase Control-Single phase AC voltage controller with R and RL loads-Derivation of R.M.S & Load Voltages-Applications-Numerical Problems.
Cyclo converters: Introduction-Single phase Bridge type & Mid-Point type cyclo converters with R and RL load (Principle of operation)

UNIT - V: DC - DC Converters

Introduction-Basic chopper operation- Time ratio and current limit control strategies– Chopper classification-Buck, Boost and Buck-Boost converters operation–Voltage and current waveforms–Derivation of output voltage–Two-quadrant & Four-Quadrant operation of choppers-Applications-Numerical problems.

UNIT - VI: DC - AC Inverters

Single phase inverters–Unipolar and bipolar switching(Half & Full Bridge) – Series and Parallel Inverters-Voltage control of Single-Phase Inverters-PWM techniques– Single pulse, Multiple pulse &Sinusoidal PWM techniques-Three phase Inverters (120^0 and 180^0 modes of operation)

Text Books:

1. Power Electronics: by M.D.Singh, K B Khanchandani. Tata Mcgraw-Hill 2nd Edition.
2. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998

Reference Books:

1. Elements of Power Electronics–PhilipT.Krein.oxford.
2. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3. Power Electronics handbook by Muhammad H. Rashid, Elsevier.

III B.TECH I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
ELECTRICAL MEASUREMENTS							

Course Objectives:

1. To understand different electrical measurements and instruments.
2. To learn the usage of bridges for the measurement of resistance, inductance and capacitance
3. To learn the usage of digital meters and types of transducers

Course Outcomes:

After completion of this course, Students will be able to

1. Understand and describe construction, principle of construction operation, errors, and compensations
2. Understand the extension of ranges of different electrical measurement instruments and understanding of error analysis.
3. Able to perform test on CTs and calculate Ratio and phase angle errors and calibrate the PF meters. To be acquainted with the knowledge of instruments that is useful for the measurement of power and energy.
4. Describe and demonstrate the usage of DC and AC bridges for the measurement of resistance, inductance and capacitance and able to calibrate different measuring instruments using potentiometers.
5. Determination of magnetic measurements including B-H curve, hysteresis loop.
6. Understand usage of different digital meters for the measurement of voltage frequency and speed.

UNIT–I: Measuring Instruments

Classification – Deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type, dynamometer and electrostatic instruments – Expression for the deflecting torque and control torque – Errors and compensations– Extension of range using shunts and series resistance – CT and PT**:** Ratio and phase angle errors – Design considerations.

UNIT –II: Measurement of Power and Energy

Single phase and three phase dynamometer wattmeter – LPF and UPF – Expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems – Type of P.F. Meters – Single phase and three phase dynamometer and moving iron type Single phase induction type energy meter – Driving and braking. torques – errors and compensations – Testing by phantom loading using R.S.S. meter– Three phase energy meter – Tri vector meter – Maximum demand meters– Electrical resonance type frequency meter and Weston type synchroscope.

UNIT – III: Potentiometers

Principle and operation of D.C. Crompton's potentiometer – Standardization – Measurement of unknown resistance – Current – Voltage – AC Potentiometers**:** polar and coordinate types –Standardization –applications.

UNIT – IV: Measurements of Parameters

Method of measuring low, medium and high resistance – Sensitivity of Wheat stone's bridge – Carey Foster's bridge– Kelvin's double bridge for measuring low resistance– Loss of charge method for measurement of high resistance – Megger– Measurement of earth

resistance – Measurement of inductance – Quality Factor – Maxwell's bridge–Hay's bridge – Anderson's bridge–Measurement of capacitance and loss angle –Desauty bridge – Schering Bridge–Wagner's earthing device–Wien's bridge.

UNIT – V: Magnetic Measurements

Ballistic galvanometer – Equation of motion – Flux meter – Constructional details– Determination of B–H Loop methods of reversals six point method – AC testing – Iron loss of bar samples– Core loss measurements by bridges andpotentiometers.

UNIT – VI: Digital Meters

Digital Voltmeter–Successive approximation – Measurement of phase difference – Frequency – Hysteresis loop using lissajious patterns in CRO – Ramp and integrating type– Digital frequency meter–Digital multimeter– Digital Tachometer.

Text Books:

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C.Widdis, fifth Edition, Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.
3. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand

Reference Books:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications.
2. Electrical Measurements – by Buckingham and Price, Prentice –Hall
3. Electrical Measurements by Forest K. Harris. John Wiley and Sons
4. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.
5. Electrical and Electronic Measurements –by G.K.Banerjee, PHI Learning Private Ltd.,New Delhi–2012.

III B.TECH I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
MICROPROCESSORS & MICROCONTROLLERS							

Course Objectives:

1. To understand the organization and architecture of Micro Processor
2. To explain the addressing modes to access memory
3. Explore how to interface microprocessor with I/O as well as other devices.
4. To familiarize 8051 micro controller architecture
5. To know the programming principles for 8086 and 8051
6. To understand how to develop cyber physical systems

Course Outcomes:

After completion of the course, Students will be able to

1. Recall the basic concepts, elements & operations of digital computer system.
2. Demonstrate memory organization and I/O processing for microprocessor and microcontroller.
3. Make use of Instruction set to develop Assembly Language Programming for computational operations.
4. Model a microprocessor based system by interfacing different electronic devices.
5. Illustrate the instruction set present in a microcontroller for different operations.
6. Develop cyber physical systems.

UNIT-I: Introduction to 8086 Microprocessor

Introduction and evolution of Microprocessors, Architecture of 8086, Register Organization of 8086, Physical memory organization of 8086, General bus operation of 8086, Introduction to 80286–80386 and 80486 and Pentium.

UNIT-II: Minimum and Maximum Mode Operations

Minimum and Maximum mode operations of 8086, 8086 Control signal interfacing, Timing diagrams, Instruction set, Addressing modes.

UNIT-III: Assembly Language Programming

Assembler Directives, Macro's, Algorithms for Implementation of FOR Loop–WHILE–REPEAT and IF-THEN-ELSE. Addressing modes and Instruction set of 8051, Assembly language programming of 8051, Development systems and tools.

UNIT-IV: 8086 Interfacing

8255 PPI– Architecture of 8255&Modes of operation, Interfacing I/O devices to 8086 using 8255, Interfacing A to D converters & Interfacing D to A converters, Stepper motor interfacing, Static memory interfacing with 8086, DMA controller (8257)–Architecture & Interfacing 8257 DMA controller, Programmable Interrupt Controller (8259)–Command words, operating modes & Interfacing of 8259, Keyboard/display controller (8279)–Architecture, Modes of operation, Command words & Interfacing of 8279.

UNIT-V: Introduction to 8051 Micro Controller

8051 Microcontroller Architecture, Register set of 8051, I/O ports and Memory Organization, Modes of timer operation, Serial port operation, Interrupt structure of 8051.

UNIT-VI: Industrial Applications of 8051

Applications of Micro Controllers, Interfacing 8051 to LED's, Push button, Relay's and Latch Connections, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing.

Text Books:

1. A.K.Ray, K.M.Bhurchandi,"Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications, 2000.
2. Douglas V Hall "Microprocessors and Interfacing" 2nd Edition, Mc–Graw Hill,.
3. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming and Applications", 2nd Edition Thomson Publishers,.

Reference Books:

1. R.S. Kaler, " A Text book of Microprocessors and Micro Controllers", I.K. International Publishing House Pvt. Ltd.
2. Ajay V Deshmukh, "Microcontrollers", TATA McGraw Hill publications, 2012.
3. Krishna Kant, "Microprocessors and Microcontrollers", PHI Publications, 2010.

III B.TECH I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
SIGNALS AND SYSTEMS							

Course Objectives:

1. To get an in-depth knowledge about signals and analysis of the same using various transforms.
2. Able to know different types of signals and their frequency domain analysis.
3. Understand the principle, filter characteristics and bandwidth of a linear system.
4. Understand the concepts of auto correlation, cross correlation and power density.

Course Outcomes:

After completion of this course, Students would be able to

1. Remember basic signals and its operations.
2. Understand Fourier series representation of different signals.
3. Translate signals from time-domain to frequency-domain and vice versa.
4. Understand the LTI system and responses for different inputs.
5. Understand different properties of Convolution methods.
6. Understand Sampling theorem, Correlation and their applications.

UNIT-I: Signal Analysis

Classification of Signals: Analog, Discrete, Digital, Deterministic & Random, Periodic & Aperiodic, Even & Odd, Energy & Power signals. Basic Operations on Signals: Time-Shifting, Time-Scaling, Time-Reversal, Amplitude Scaling and Signal Addition. Elementary Signals: Unit Step, Unit Ramp, Unit Parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function, Sinc function and Signum function. Signal approximation using orthogonal functions, Mean square error.

UNIT-II: Fourier Series

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet‘s conditions, Trigonometric Fourier Series and Exponential Fourier Series, Conversion of Exponential Fourier Series from Trigonometric Fourier series & vice versa.

UNIT-III: Fourier Transforms

Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of periodic signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function.

UNIT-IV: Signal Transmission through Linear Systems

System and its types: Linear & Non-Linear, Time Variant & Time Invariant, Causal & Non Causal, Static & Dynamic, Stable & Unstable. Impulse response of a linear time invariant (LTI) system and linear time variant (LTV) system, Transfer function of a LTI system, Filter characteristics of linear systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF and its characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time.

UNIT-V: Sampling

Sampling theorem, Types of Sampling: Impulse Sampling, Natural and flattop Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

UNIT-VI: Convolution, Correlation and PSD of Signals

Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms, Cross correlation and auto correlation functions, Properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function, Relation between convolution and correlation.

Text Books:

1. B.P. Lathi "Signals, Systems and Communications" –BS Publications, 2008.
2. Simon Haykin and Van Veen, Wiley "Signals and Systems"2nd Edition, 2003.

Reference Books:

1. A.V. Oppenheim, A.S. Will sky and S.H. Nawab "Signals and Systems" 2nd Edition, PHI, 2013.
2. P. Ramesh Babu, "Signals and Systems", 3rd Edition, SciTech Publications, 2011.
3. A.Anand Kumar, "Signals and Systems", 3rd Edition, PHI Publications, 2013.

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
RENEWABLE ENERGY SOURCES (Professional Elective-I)							

Course Objectives:

1. To study the solar radiation data and radiation on earth's surface.
2. To study solar photo voltaic energy conversion and solar pond.
3. To study wind energy conversion and Bio-mass.
4. To study basic principle and working of Geothermal, Tidal, thermal and MHD Generators.

Course Outcomes:

After completion of this course, Students will be able to

1. Analyze the significance of renewable energy.
2. Understand the principles of solar radiation and design the solar collectors.
3. Know the functioning of basic components of wind energy and understand the utilization of biomass in power generation.
4. Understand the working principles of geothermal, ocean, tidal and wave energy techniques.
5. Know the functioning of direct energy conversion techniques.
6. Understand the MHD power generation and its future prospects

UNIT – I: Principles of Solar Radiation

Introduction to Energy Sources and their availability- renewable sources-The solar constant-Solar Radiation at the Earth's surface- solar radiation Geometry- instruments for measuring solar radiation and sun shine- solar radiation data- solar radiation on titled surfaces with numerical problems.

UNIT – II: Solar Energy Storage and Applications

Different methods- Sensible, latent heat and solar ponds-Applications of Solar ponds- solar heating-Photovoltaic energy conversion.

UNIT – III: Wind Energy and Bio-Mass

Principles of wind energy conversion, Components of WECS- horizontal and vertical axis windmills- performance characteristics. Bio fuels- Methods for obtaining energy from Biomass-Thermal gasification of Biomass.

UNIT – IV: Geothermal Energy, Ocean Energy, Tidal and Wave Energy

Introduction of Geothermal Energy- Nature of Geothermal fields- Geothermal Sources-Potential of Geothermal resources in India- OTEC- Methods of ocean thermal electric power generation- Open cycle and closed cycle- Principle of Tidal power- Components of Tidal power plants- Advantages and Disadvantages of Wave energy- Energy and power from the Waves.

UNIT – V: Thermal Electric Power

Introduction- Thermo electric power generation- See-beck, Peltier, Thomson effects- Thermo electric power generation- Thermo electric materials- Selection of materials.

UNIT – VI: MHD Power Generation

Introduction- Principle of MHD power generation- MHD Systems- Open cycle and closed cycle

Systems- Advantages of MHD Systems- International Status of MHD power generation and its future prospects.

Text Books:

1. G.D. Rai, “Non-Conventional Energy Sources”, Dhanpat Rai and Sons
2. Tiwari and Ghosal, “Renewable energy resources”,Narosa.

Reference Books:

1. Twidell& Weir, “Renewable Energy Sources“
2. Sukhatme, “Solar Energy”, Tata McGraw-HillEducation.
3. B.S Magal Frank Kreith& J.F Kreith, “Solar Power Engineering“
4. Frank Krieth& John F Kreider, “Principles of SolarEnergy”

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
ELECTRICAL MACHINE DESIGN (Professional Elective-1)							

Course Objectives:

1. To develop knowledge on principles of design of static and rotating machines.
2. To find out the dimension of various parts of the machine.
3. To examine various loadings in the machines.
4. To Study manufacturing and heating cooling techniques of materials

Course Outcomes:

After completion of this course, Students will be able to

1. Understand Material Selection, Heating & Cooling Techniques.
2. Understand the design of various types of windings.
3. Understand the design of various parts of DC machines and solve the problems of design
4. Understand the design concepts of transformers and know about how to design the parts.
5. Understand the design concepts of synchronous machines and solve the problems related to design.
6. Understand the importance of design of machines based on their applications.

UNIT-I: Introduction to Electrical Machine Design

Design concepts- factors- Material Selection- Manufacturing techniques- Review of basic Principles- Heating & Cooling Techniques.

UNIT-II: Armature Windings (AC & DC)

Single layer winding- two layer winding- lap and wave windings- concept of pole pitch- emf generation -full pitch coil, fractional pitch coil and concentrated winding.

UNIT-III: DC Machines

Constructional details – Output equation - Choice of specific electric and magnetic loadings - Separation of D and L for rotating machines. Estimation of number of conductors/turns - Coils - armature Slots - Conductor dimension - Slot dimension. Choice of number of poles - Length of air gap - Design of field system- Interpoles- Commutator and Brushes.

UNIT-IV: Transformers

Construction-Comparison of Core and Shell type, Single and Three phase transformer comparison-Core and Yoke Design – cross section- cooling of transformers- Number of tubes-Transformer windings-Coil design- Output equation- determination of number of turns and length of mean turn of winding- Resistance- Leakage reactance.

UNIT-V: Induction Motors

Choice of specific electric and magnetic loadings- Stator Design (Frames)- output equation-choice of conductor rating- stator winding- and stator slots- Squirrel cage rotor design - air gap length- rotor slots and rotor bars- Design of wound rotor - rotor slots-windings.

UNIT –VI: Synchronous Machines

Constructional features - short circuit ratio - Output equation - Specific loadings - Main dimensions - Stator design - Design of Salient Pole field coil.

Text Book:

1. "Electrical Machine Design", Sawhney, Dhanpath Rai &Co

Reference Books:

1. "Performance and Design of DC Machines", Clayton & Hancock,ELBS.
2. "Performance and Design of AC Machines", M.G.Say; Pitman,ELBS.

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
MICRO ELECTRO MECHANICAL SYSTEMS (Professional Elective-I)							

Course Objectives:

1. To learn basics of Micro Electro Mechanical Systems (MEMS).
2. To learn about various sensors and actuators used in MEMS.
3. To learn the principle and various devices of MOEMS, Fluidic.
4. To learn the concepts of bio and chemical systems and devices.

Course Outcomes:

After completion of this course, Students will be able to

1. Learn basics of Micro Electro Mechanical Systems (MEMS) & essential material properties.
2. Learn the principle and various devices of MOEMS, Micro Fluidic systems.
3. Study the Chemical and Bio Medical Micro Systems.
4. Know machining process of MEMS.
5. Know about the optical MEMS.
6. Understand the operational theory of common MEMS sensors and MEMS actuators.

UNIT-I: Introduction

Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods. Principles of sensing and actuation: piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator.

UNIT-II: Thermal Sensors and Actuators

Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, pettier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

UNIT-III: Micro-Opto-Electro Mechanical Systems

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT-IV: Magnetic Sensors and Actuators

Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on Hall Effect, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, bidirectional micro actuator, and feedback circuit integrated magnetic actuator.

UNIT-V: Micro Fluidic Systems

Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow. Radio Frequency MEMS: RF - based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

UNIT-VI: Chemical and Bio Medical Micro Systems

Sensing mechanism & principle, membrane-transducer materials, chem.-lab-on-a-chip (CLOC) chemo resistors, chemo capacitors, chemo transistors, electronic nose(E-nose), mass sensitive chemo sensors, fluorescence detection, calorimetric.

Text Books:

1. MEMS, Nitaigour Premchand Mahalik, TMH Publishing co.

Reference Books:

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. MEMS and NEMS, Sergey Edwrd Lyshevski, CRC Press, Indian Edition.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.
4. Introductory MEMS, Thomas M Adams, Richard A Layton, Springer International Publishers.

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
INDUSTRIAL INSTRUMENTATION (Professional Elective-I)							

Course Objectives:

1. To study various types of signals and their representation, various types of transducers: Electrical, Mechanical, Electromechanical, Optical etc.
2. To study and measure the various types of Non–electrical quantities.
3. To study various types of digital voltmeters and the working principles of various types of oscilloscopes and their applications.
4. To study various types of signal analysers.

Course Outcomes:

After completion of this course, Students will be able to

1. To understand various types of signals and their representation.
2. To study various types of transducers: Electrical, Mechanical, Electromechanical, Optical etc.
3. To analyze the measurement of the various types of Non–electrical quantities.
4. To study various types of digital voltmeters
5. To study the working principles of various types of oscilloscopes and their applications.
6. To study various types of signal analyzers.

UNIT-I: Signals and their representation

Measuring Systems, Performance Characteristics, - Static characteristics - Dynamic Characteristics - Errors in Measurement - Gross Errors - Systematic Errors -Statistical analysis of random errors – Signal and their representation – Standard test, periodic, aperiodic, modulated signal –Sampled data pulse modulation and pulse code modulation.

UNIT-II: Transducers

Definition of transducers – Classification of transducers – Advantages of Electrical transducers – Characteristics and choice of transducers – Principle operation of resistor, inductor, inductive and capacitor transducers – LVDT Applications – Strain gauge and its principle of operation – Gauge factor

UNIT-III: Measurement of Non–Electrical Quantities

Measurement of strain – Gauge Sensitivity – Displacement – Velocity –Angular Velocity – Acceleration – Force – Torque – Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

UNIT-IV: Digital Voltmeters

Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Microprocessor based ramp type – DVM digital frequency meter – Digital phase angle meter.

UNIT-V: Oscilloscope

Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns –Sampling oscilloscope

UNIT-VI: Signal Analyzers

Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion –Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters.

Text Books:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition,1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat rai & Co.

Reference Books:

1. Measurement and Instrumentation theory and application, AlanS. Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D ODoeblin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson / Prentice Hall of India
4. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick and W.D. Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
CONTROL SYSTEMS AND MEASUREMENTS LABORATORY							

Course Objectives:

1. To understand the correct function of electrical parameters and calibration of voltage, current, single phase and three phase power and energy.
2. To understand testing of transformer oil & measure the parameters of choke coil.
3. To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, DC servo motors, AC Servo motors, stepper motor and potentiometer.

Course Outcomes:

After completion of this course, Students will be able to

1. Measure accurately the electrical parameters voltage, current, power, energy.
2. To test transformer oil for its effectiveness and measure the parameters of Chokecoil.
3. Analyze the performance and working Magnetic amplifier, D.C. servo motors, A.C. Servo motors.
4. Design P, PI, PD and PID controllers and lag, lead and lag–leadcompensators.

LIST OF EXPERIMENTS

Any Ten experiments from the following list are required to be conducted.

1. Transfer function of DC generator.
2. Characteristics of AC servomotor.
3. Lag and lead compensation – Magnitude and phase plot.
4. Characteristics of DC Servomotor.
5. Characteristics of Magnetic amplifier.
6. Time response of a second order system.
7. Effect of P, PD, PI, PID Controller on a second order system.
8. Kelvin’s double Bridge - Measurement of resistance.
9. Capacitance measurement using Anderson Bridge.
10. Calibration and testing of single phase energy meter
11. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
12. Crompton DC potentiometer- Calibration of PMMC Ammeter and PMMC Voltmeter.
13. C.T Testing using mutual inductor- measurement of % ratio error and phase angle error of given C.T by Null method.
14. LVDT and Capacitance pickup – Characteristics and Calibration.
15. Dielectric Oil Testing of Transformer Oil.

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
ELECTRICAL MACHINES - II LABORATORY							

Course objectives:

1. To predetermine the efficiency and regulation of transformers and assess their performance.
2. To predetermine the regulation of three–phase alternator by various methods.
3. To find X_d/X_q ratio of alternator and asses the performance of three–phase synchronous motor.
4. To perform various tests on Induction motor for assessing its performance.

Course Outcomes:

After completion of this course, Students will be able to

1. Conduct open circuit/ short circuit test on transformer
2. Perform test on synchronous Machine to find Direct and quadrature axis reactance
3. Conduct No Load and Full load tests on transformers/Induction Motor
4. Calculate torque and speed of given Machine.

LIST OF EXPERIMENTS

Any 10 of the following experiments are to be conducted:

1. O.C. & S.C. Tests on Single phase Transformer.
2. Parallel operation of Single phase Transformers.
3. Sumpner's test on single phase transformers.
4. Scott connection of transformers.
5. Brake test on three-phase induction motor.
6. No-load & blocked rotor tests on three- phase induction motor and circle diagram.
7. Determination of equivalent circuit parameters of a single phase induction motor.
8. Regulation of a three-phase alternator by synchronous impedance, M.M.F. Methods.
9. Determination of $X_d$and X_q of a salient pole synchronous generator.
10. V and inverted-V curves of a three-phase synchronous motor.
11. Measurement of sequence impedance of a three-phase alternator.

III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	-	-	-	-	-	-
ADVANCED COMMUNICATION SKILLS							

Course Objectives:

1. To make the students conscious about their Non-Verbal communication
2. Train the students to use the language effectively to face interviews and participate in Group Discussions.
3. To develop effective written communication skills in academic, technical and professional contexts.
4. Develop critical thinking skills necessary to become employable.

Course Outcomes:

After completion of this course, Students will be able to

1. Use English language fluently, accurately and appropriately
2. Know how body language is used in communication and interpret non-verbal symbols.
3. Understand the nuances of the written language and write technical reports effectively.
4. Participate in Group discussions and successfully face interviews.

Unit-1: **Non-Verbal Communication**

Unit-2: **Resume Preparation**

Unit-3: **E-mail writing & Professional Letter writing**

Unit-4: **Essay Writing & Paragraph writing**

Unit-5: **Group discussion**

Unit-6: **Interview skills**

References:

1. Rajendra Pal, J S KorlahaHi, *Essentials of Business Communication,* Sultan Chand & Sons
2. Andrea J. Rutherford, *Basic Communication Skills for Technology,* Pearson Education Asia
3. V. Prasad, *Advanced Communication Skills,*Atma Ram Publications
4. Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press
5. Sanjay Kumar, PushpLata, *Communication Skills,* Oxford University Press
6. Meenakshi Raman, Sangeeta Sharma, *Fundamentals of Technical Communication,* Oxford University Press

III B.TECH II SEMESTER

III B.TECH. – II SEMESTER COURSE STRUCTURE

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Power System Analysis	PC	3	1	-	40	60	100	3
2	Power Semiconductor Drives	PC	3	1	-	40	60	100	3
3	Data Structures	ES	3	1	-	40	60	100	3
4	**Professional Elective - II** 5. Electrical Distribution Systems 6.Energy Audit Conservation and Management 7.Digital Signal Processing 8.Special Machines	PE	3	1	-	40	60	100	3
5	Open Elective – I	OE	4		-	40	60	100	3
6	Power Electronics Lab	PC	-	-	3	25	50	75	2
7	Data Structures Lab	ES	-	-	3	25	50	75	2
8	Microprocessors and Microcontrollers Lab	PC	-	-	3	25	50	75	2
9	Quantitative Aptitude & Reasoning II	MC	3	-	-	-	-	-	-
	Total		19	4	9	275	450	725	21

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER SYSTEM ANALYSIS							

Course Objectives:

1. To study the development of impedance diagram (p.u) and formation of Y_{bus} and the Gauss Seidel, Newton raphson, decoupled and fast decoupled load flow methods.
2. To study the concept of the Z_{bus} building algorithm. And short circuit calculation for symmetrical faults
3. To study the effect of unsymmetrical faults.
4. To study the rotor angle stability analysis of power systems

Course Outcomes:

After completion of this course, Students will be able to

1. Draw an impedance diagram for a power system network.
2. Form a Y_{bus} matrix for a power system network with or without mutual couplings.
3. Find out the load flow solution of a power system network using different types of load flow methods.
4. Formulate the Z_{bus} for a power system network.
5. Find out the fault currents for all types faults with a view to provide data for the design of protective devices.
6. Find out the sequence components of currents for any unbalanced power system network.

UNIT –I: Per Unit Representation & Topology

Per Unit Quantities–Single line diagram– Impedance diagram of a power system – Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y_{bus} matrix by singular transformation and direct inspection methods.

UNIT –II: Power Flow Studies

Necessity of power flow studies – Derivation of static power flow equations – Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) –Decoupled and Fast Decoupled methods (Algorithmic approach) – Problems on 3–bus system only.

UNIT –III: Z–Bus formulation

Formation of Z–Bus**:** Partial network– Algorithm for the Modification of Z_{bus} Matrix for addition element for the following cases**:** Addition of element from a new bus to reference– Addition of element from a new bus to an old bus– Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems).– Modification of Z_{bus} for the changes in network(Problems).

UNIT – IV: Symmetrical Fault Analysis

3–Phase short circuit currents and reactance's of synchronous machine–Short circuit MVA calculations.

UNIT –V: Symmetrical Components & Fault analysis

Synthesis of unsymmetrical phasor from their symmetrical components– Symmetrical components of unsymmetrical phasor–Phase - shift of symmetrical components in Y-Δ transformers- Power in terms of symmetrical components – Sequence networks – Positive, negative and zero sequence networks of unloaded generator and transmission lines– Various types of faults: LG, LL, LLG and LLL on unloaded alternator.

UNIT – VI: Power System Stability Analysis

Elementary concepts of Steady state– Dynamic and Transient Stabilities– Description of Steady State Stability Power Limit–Transfer Reactance– Synchronizing Power Coefficient – Power Angle Curve and Determination of Steady State Stability –Derivation of Swing Equation–Determination of Transient Stability by Equal Area Criterion–Application of Equal Area Criterion–Methods to improve steady state and transient stability.

Text Books:

1. Power System Analysis by Grainger and Stevenson, Tata Mc Graw Hill.
2. Electrical Power Systems by P.S.R.Murthy, B.S.Publications
3. Modern Power system Analysis – by I.J.Nagrath & D.P.Kothari: Tata Mc Graw–Hill Publishing Company, 2ndedition.
4. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J. Overbye – CengageLearningpublications.

Reference Books:

1. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
2. Power System Analysis by HadiSaadat – TMH Edition.
3. Power System Analysis by B.R.Gupta, Wheeler Publications.

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER SEMICONDUCTOR DRIVES							

Course Objectives:

1. To learn the fundamentals of electric drive and different electric braking methods.
2. To analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
3. To discuss the converter control of dc motors in various quadrants
4. To learn the principles of static rotor resistance control and various slip power recovery schemes

Course Outcomes:

After completion of this course, Students will be able to

1. Understand the fundamentals of electric drive and different electric braking methods.
2. Analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
3. Discuss the converter control of dc motors in various quadrants.
4. Understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
5. Analyze the principles of static rotor resistance control and various slip power recovery schemes.
6. Understand the speed control mechanism of synchronous motors

UNIT-I: Fundamentals of Electric Drives

Electric drive – Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods: Dynamic – Plugging – Regenerative methods.

UNIT-II: Three phase converter controlled DC motors

Revision of speed control techniques – Separately excited and series motors controlled by full converters – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics – Numerical problems – Four quadrant operation using dual converters

UNIT-III: Control of DC motors by DC–DC converters

Single quadrant – Two quadrant and four quadrant chopper fed separately excited and series excited motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics –Four quadrant operations – Closed loop operation (Block diagrams only).

UNIT-IV: Induction motor control – Stator side

Variable voltage characteristics– Control of Induction Motor by AC Voltage Controllers – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by voltage source inverter –PWM control – Closed loop operation of induction motor drives (Block Diagram Only).

UNIT–V: Control of Induction motor – Rotor side

Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics – Advantages –Applications.

UNIT–VI: Control of Synchronous Motors

Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives (Block Diagram Only) –Variable frequency control–Pulse width modulation

Text Books:

1. Fundamentals of Electric Drives – by G K Dubey Narosa Publications
2. Power Semiconductor Drives, by S.B. Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition.

Reference Books:

1. Electric Motors and Drives Fundamentals, Types and Aplications, by Austin Hughes and Bill Drury, Newnes.
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications.
3. Power Electronic Circuits, Devices and applications by M.H. Rashid, PHI.

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
DATA STRUCTURES							

Course Objectives:

1. Comprehensive knowledge of data structures and exposure to recursive algorithms, searching and sorting techniques
2. Apply stack and queue data structures for logical operations
3. Understand Linked-list representation models in various types of applications
4. Implementation of trees in various forms, orientation on graphs, representation of graphs, graph traversals

Course Outcomes:

After completion of this course, Students will be able to

1. Analyze sorting and searching algorithms.
2. Summarize elementary data structures such as stacks, queues and linked lists.
3. Compare and contrast various forms of trees.
4. Outline graph data structures and various graph traversal techniques.

UNIT - I: Introduction to Data Structures and Algorithms

Basic Terminology, Elementary Data Structure Organization, Classification of Data structures, Operations on Data structures, Abstract Data Type.

Recursion: Pseudo code, Recursive examples, Factorial, GCD implementation, Fibonacci numbers.

UNIT - II: Searching and Sorting

Introduction to Searching, Linear Search, Binary Search, Introduction to Sorting, Internal Sorting, External Sorting, Insertion sort, Merge sort.

UNIT - III: Stacks

Introduction to stacks, Array Representation of stacks, Operations on stack, push operation, pop operation, peek operation, Linked representation of stacks, operations on a linked stack, push operation, pop operation, applications of stacks, evaluation of a postfix expression, conversion of infix expression into a prefix expression.

Queues: Introduction, Array Representation of Queues, Linked representation of Queues, Circular Queues, Applications of queues.

UNIT - IV : Linked Lists

Introduction, Basic terminologies, Linked lists versus Arrays, Memory allocation and De-allocation for a linked list, single linked list, Traversing a Linked List, Searching a value in a linked list, inserting a new node in a linked list, Deleting a node from a linked list, Circular linked list, inserting a new node in a Circular linked list, Deleting a node from a Circular linked list, Doubly linked list, inserting a new node in a Doubly linked list, Deleting a node from a Doubly linked list.

UNIT - V: Trees

Introduction, Basic Terminology, Types of Trees, General Trees, Forests, Binary Trees,, Expression Trees, Traversing a Binary Tree, Pre-order Traversal, In-order Traversal, Post-order traversal, Level order traversal, (recursive & non-recursive)**,** Constructing a Binary Tree from Traversals**,** Binary Search Trees, operations on Binary Search Trees, Searching for a node in

Binary Search Tree, inserting a new node in Binary Search Tree, Deleting a node from a Binary Search Tree.

UNIT – VI: Graphs

Introduction, Graph Terminology, Directed Graphs, Representations of Graphs, Graph Traversal algorithms, Breadth- First Search Algorithm, Depth-First-Search Algorithm.

Text Books:

1. Data Structures using C, Reema Thareja, Oxford, Second Edition, 2014 (UNITS: I, II, III, IV, V & VI)
2. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage (UNIT: I)

Reference Books:

1. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH
2. Data Structure with C, Seymour Lipschutz, TMH
3. Data structures and algorithm analysis in C, 2/e, Mark Allen Weiss

Additional Resources:

1. nptel.ac.in/courses/106102064/1
2. nptel.ac.in/courses/106103069

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
ELECTRICAL DISTRIBUTION SYSTEMS (Professional Elective-II)							

Course Objectives:

1. To study different factors of Distribution system and the substations design.
2. To study the concepts of voltage drop and power loss.
3. To study the distribution system protection and its coordination.
4. To study the effect of compensation for power factor improvement & effect of voltage control on distribution system.

Course Outcomes:

After completion of this course, Students will be

1. Able to understand various factors of distribution system.
2. Able to design the substation and feeders.
3. Able to determine the voltage drop and power loss
4. Able to understand the protection and its coordination.
5. Able to understand the effect of compensation for power factor improvement.
6. Able to understand the effect of voltage control.

UNIT – I: General Concepts

Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial).

UNIT – II: Substations and Feeders

Location of substations: Rating of distribution substation –Service area with 'n' primary feeders –benefits and methods of optimal location of substations.

Distribution Feeders: Design Considerations of distribution feeders: Radial and loop types of primary feeders – Voltage levels – Feeder loading-Basic design practice of the secondary distribution system.

UNIT – III: System Analysis

Voltage drop and power–loss calculations: Derivation for voltage drop and power loss in lines – Uniformly distributed loads, non-uniformly distributed loads and Non 3-Φ loads– Numerical problems - Three phase balanced primary lines.

UNIT – IV: Protection & Coordination

Protection: Objectives of distribution system protection –Protective devices: Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers.

Coordination: General coordination procedure –Various types of coordinated operation of protective devices - Residual Current Circuit Breaker.

UNIT – V: Compensation for Power Factor Improvement

Capacitive compensation for power factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor

correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location – Numerical problems.

UNIT – VI: Voltage Control

Voltage Control: Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR – Line drop compensation – Numerical problems.

Text Book:

1. "Electric Power Distribution system, Engineering" – by Turan Gonen, McGraw–hill Book Company.

Reference Books:

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing company, 4thedition, 1997. 3. Electrical Power Distribution Systems by V.Kamaraju, Right Publishers.

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
ENERGY AUDIT, CONSERVATION & MANAGEMENT (Professional Elective-II)							

Course Objectives:

1. To understand energy efficiency, scope, conservation and technologies and design energy efficient lighting systems.
2. To estimate/calculate power factor of systems and propose suitable compensation techniques.
3. To understand energy conservation in HVAC systems.
4. To calculate life cycle costing analysis and return on investment on energy efficient technologies

Course Outcomes:

After completion of this course, Students will be able to

1. Explain energy efficiency, conservation and various technologies.
2. Design energy efficient lighting systems.
3. Calculate power factor of systems and propose suitable compensation techniques.
4. Explain energy conservation in HVAC systems.
5. Calculate life cycle costing analysis and return on investment on energy efficient technologies.
6. Understand economic aspects and analysis.

UNIT–I: Basic Principles of Energy Audit and management Energy audit

Basic Principles of Energy Audit and management Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Principles of energy management –Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions – Language – Questionnaire – Check list for top management.

UNIT–II: Lighting

Modification of existing systems – Replacement of existing systems – Priorities: Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level – Illumination of inclined surface to beam – Luminance or brightness – Types of lamps – Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

UNIT–III: Power Factor and energy instruments

Power factor – Methods of improvement – Location of capacitors – Power factor with nonlinear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tong testers – Power analyzer.

UNIT–IV: Space Heating and Ventilation

Ventilation – Air–Conditioning (HVAC) and Water Heating: Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning – Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

UNIT–V: Economic Aspects and Analysis

Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts).

UNIT–VI: Computation of Economic Aspects

Calculation of simple payback method – Net present worth method – Power factor correction -Lighting – Applications of life cycle costing analysis – Return on investment.

Text Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications.2012
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995

Reference Books:

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
2. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
3. Energy management hand book by W.C.Turner, John wiley and sons.
4. Energy management and conservation –k v Sharma and p venkataseshaiah-I K International Publishing House pvt.ltd,2011.

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
DIGITAL SIGNAL PROCESSING (Professional Elective-II)							

Course Objectives:

1. Enhance the analytical ability of the students in facing the challenges posed by growing trends in communication, control and signal processing areas.
2. Develop ability among students for problem formulation, system design and solving skills
3. Demonstrate basic knowledge of Digital Signal Processing by understanding various Transformations.
4. Understand Various Discrete-time signals and class of linear shift-invariant systems will be studied using the convolution sum, and the frequency domain, using transformations.
5. Design system with digital network composed of adders, delay elements, and coefficient multipliers.

Course Outcomes:

After completion of the course, Students will be able to

1. Analyze the signals and system in Time and Frequency domain through its respective tools.
2. Find DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithm.
3. Explain the significance of various filter structures and effects of roundoff errors.
4. Demonstrate knowledge of complex number, Fourier series and ability to design electrical and electronics systems.
5. Construct the digital filter circuits for generating desired signal wave shapes (non-sinusoidal) for different applications like computers, control systems and counting and timing systems.
6. Develop the digital computer or digital hardware for quantizing amplitudes of signals.

UNIT-I: Introduction

Review of Discrete Time Signals: Some Elementary Discrete-Time Signals, Classification of Discrete–Time Signals, Simple Manipulations of Discrete–Time Signals, Discrete Time Systems: Input-Output Description of Systems, Block Diagram Representation of Discrete-Time Systems, Classification of Discrete-Time Systems Interconnection of Discrete-Time Systems. Frequency domain representation of Discrete Time Signals and Systems, Discrete-Time Fourier Transform (DTFT): Existence of DTFT, properties of DTFT.

Discrete Fourier Series: Properties of Discrete Fourier Series, DFS representation of periodic sequences.

UNIT-II: Discrete Fourier Transforms

Properties of DFT, Circular & Linear Convolution of Sequences using DFT, and Computation of DFT: Direct evaluation of the DFT.

FAST FOURIER TRANSFORMS: Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms: radix-2 DIT-FFT, DIF-FFT, and Inverse FFT: IDFT-FFT.

UNIT-III: Realization of IIR Filters

Review of Z-Transforms: z-transform and ROC of finite and infinite sequence, properties of z-transform, relationship between the Fourier transform and z-transform, inverse z-transform. Solution of Difference Equations of Digital Filters, Block Diagram Representation of Linear Constant Coefficient Difference Equations, Basic structures of IIR systems: Direct form-I

realization, Direct form-II realization, transposed, cascade form, parallel form. Lattice structures of IIR systems, Conversion from Lattice structure to direct form, Conversion from direct from to Lattice structure, Lattice-ladder structure.

UNIT-IV: Realization of FIR Filters

Basic structures of FIR systems: Transversal structure, Linear phase, Lattice structure, Polyphase Lattice structures of FIR systems, Conversion from Lattice structure to direct form, Conversion from direct from to Lattice structure, Lattice-ladder structure.

UNIT-V: IIR Digital Filters

Analog filters approximations: Butterworth and Chebyshev, Design of IIR digital filters from analog filters, Design examples, Frequency Transformations in Analog Domain: Low pass to Low pass filter, Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter. Frequency Transformations in digital domain: Low pass to Low pass filter, Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter.

UNIT-VI: FIR Digital Filters

Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Digital Filters Using Window Techniques: Rectangular Window, Triangular or Bartlett Window, Raised Cosine Window Hanning Window, Blackman Window, Kaiser Window, Frequency Sampling Technique: Frequency Sampling Realization, Frequency Response, Design, Comparison of IIR and FIR filter, Illustrative Problems.

Text Books:

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications" Pearson Education/PHI, 4th Edition, 2007.
2. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing" 2nd Edition, PHI.

Reference Books:

1. Digital Signal Processing by Ramesh Babu.
2. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
3. A Text book on Digital Signal processing – R S Kaler, M Kulkarni,, Umesh Gupta, I K International Publishing House Pvt. Ltd.
4. Digital signal processing: M H Hayes, Schaum's outlines, TATA Mc-Graw Hill, 2007.

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
SPECIALMACHINES (Professional Elective-II)							

Course Objectives:

1. To study theory of operation and control of single phase motors like universal motor, servo motors etc.
2. To understand theory of operation and control of switched reluctance motor.
3. To explain the performance and control of stepper motors, and their applications.
4. To describe the operation and characteristics of permanent magnet dc motor.
5. To distinguish between brush dc motor and brush less dc motor.
6. To study the theory of travelling magnetic in linear motors and the significance of electrical motors for traction drives

Course Outcomes:

After completion of this course, Students will be able to

1. Explain theory of operation and control different types of single phase motors like Universal motor & Servo motors etc.
2. Explain theory of operation and control of switched reluctance motor.
3. Contrast the performance and control of stepper motors, and their applications.
4. Classify different types of permanent magnet materials & explain PMDC motor operation.
5. Compare brush dc motor and brush less dc motor.
6. Explain the theory of travelling magnetic field in linear motors & summarize the AC&DC Traction systems.

UNIT I: Single phase Special Electrical Machines

Introduction- Single phase Induction Motor types-Comparison between 1-Φ & 3-Φ Induction motors-AC series Motor (Universal Motor)
Servo Motor- Types –construction- operating principle and application

UNIT II: Switched Reluctance Motor

Construction- -Principle of operation – Rotor Sensing mechanism- Torque & Voltage Equations– Various Power converters for switched reluctance motor – Control of switched reluctance motor-Applications.

UNIT III: Stepper Motors

Basic terms used in Stepper Motors-Theory of Torque Production–Types of Stepper Motors Construction–Principle of operation–Permanent Magnet Stepping Motor- Variable reluctance stepping motor – Hybrid stepping motor- Applications-Numerical Problems.

UNIT IV: Permanent Magnet DC Motors

Introduction-Permanent magnet materials-Construction – Principle of working – Torque equation and equivalent circuits – Performance characteristics – Moving coil motors-Applications.

UNIT V: Permanent Magnet Brushless DC Motor

Introduction -Construction –Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations –Commutation – Power controllers – Motor characteristics and control-Applications.

UNIT VI: Electric Motors for traction drives

Introduction-Linear Induction motors-Characteristics of Traction motor – Single sided & Double sided linear induction motor for traction drives – Comparison of AC and DC traction systems.

Text Books:

1. Special electrical Machines, K.Venkata Ratnam, University press, 2009, New Delhi.
2. Special electrical Machines , Simmi P.Bumran Katson books S.K.Kataria & Sons

Reference Books:

1. Electrical machines, Rajput Laxmi Publications.
2. Electrical machines, by Ashfaq Hussain, Dhanpat Rai Publications.

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
POWER ELECTRONICS LAB							

Course Objectives:

1. To study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
2. To analyze the performance of single–phase and three–phase full wave bridge converters, single–phase dual converter with both resistive and inductive loads.
3. To understand the operation of AC voltage controller and cyclo converter with resistive and inductive loads.
4. And the working of Buck converter, Boost converter, single–phase bridge inverter and PWM inverter.

Course Outcomes:

After completion of this course, Students will be able to

1. Study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
2. Analyze the performance of single–phase and half wave and Full wave bridge converters, single–phase dual converter with both resistive and inductive loads.
3. Understand the operation of AC voltage controller and cyclo converter with resistive and inductive loads.
4. Understand the working of Buck converter, Boost converter, single–phase bridge inverter and PWM inverter.

Any 10 of the Following Experiments are to be conducted

1. Study of Characteristics of SCR, MOSFET &IGBT
2. Study of Gate firing circuits for SCR’s
3. Forced commutation circuits(Class A, Class B, Class C, Class D)
4. Single -Phase Half controlled converter with R and RL load
5. Single -Phase fully controlled bridge converter with R and RL loads
6. Single -Phase AC Voltage Controller with R and RL Loads
7. Single -Phase Cyclo–converter with R and RL loads
8. Single -Phase Bridge Inverter with R and RL Loads
9. Single -Phase dual converter with R and RL Loads
10. Single -Phase parallel inverter with R and RL Loads
11. Three -Phase half controlled bridge converter with RL load.
12. Three- Phase full converter with RL–load.
13. Single -phase PWM inverter.

III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
DATA STRUCTURES LAB							

Course Outcomes:

After completion of this course, Students will be able to

1. Develop various algorithms using recursive and non-recursive functions.
2. Experiment with linear data structures.
3. Apply Tree traversal techniques in various applications.

Week – 1

a) Write a recursive C program which computes the n^{th} Fibonacci number, for appropriate values of n.

b) Write recursive C programs for the following

i) Factorial of a given number
ii) GCD Computation
iii) Towers of Hanoi

Week – 2

a) Write a C program that use both recursive and non-recursive functions to perform linear search.

b) Write a C program that use both recursive and non-recursive functions to perform binary search.

Week -- 3

a) Write a C program to implement Bubble sort.
b) Write a C program to implement Insertion sort.
c) Write a C program to implement Selection sort.

Week -- 4

a) Write a C program to implement Quick sort.
b) Write a C program to implement Merge sort.
c) Write a C program to implement heap sort.

Week -- 5

a) Write a C program to implement Stack operations using arrays
b) Write a C program to implement Queue operation using arrays.
c) Write a C program to convert infix expression into postfix expression using stack.

Week -- 6

a) Write a C program to implement Stack operation using Linked list.
b) Write a C program to implement Queue operations using Linked lists.

Week – 7

a) Write a C program to implement the following operations on a singly Linked using functions

i) Insertion
ii) Deletion
iii) Displaying
iv) Reversing

Week - 8

a) Write a C program to implement following Operations on a Binary Tree

i) Create
ii) In-order traversal
iii) Pre-order traversal

iv) Post-order traversal

b) Write a C program to implement following Operations a Binary Search Tree
   i) Create
   ii) Insert
   iii) Delete

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
MICROPROCESSORS AND MICROCONTROLLERS LAB							

Course Objectives:

1. To study programming based on 8086 microprocessor and 8051 microcontroller.
2. To learn 8086 microprocessor based ALP using arithmetic, logical and shift operations.
3. To understand modular and Dos/Bios programming using 8086 microprocessor.
4. Familiarize to interface 8086 with I/O and other devices.

Course Outcomes:

After completion of this course, Students will be able to

1. Build Up the assembly language programs on arithmetic, logical and string operations.
2. Construct an 8086 system by interfacing I/O and other devices.
3. Make Use of Instruction set of 8086 for modular programming and Dos/Bios programming.
4. Model the 8051 based embedded systems for various applications.

I. Microprocessor 8086:

Any 8 of the following experiments are to be conducted:

1. Introduction to MASM/TASM.
2. Arithmetic operation – Multi byte addition and subtraction, multiplication and division – Signed and unsigned arithmetic operation, ASCII – Arithmetic operation.
3. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix**:** Move block, Reverse string Sorting, Inserting, Deleting, Length of the string, String comparison.
5. Modular Program: Procedure, Near and Far implementation, Recursion.
6. Dos/BIOS programming: Reading keyboard (Buffered with and without echo) – Display characters, Strings.
7. Interfacing 8255–PPI
8. Programs using special instructions like swap, bit/byte, set/reset etc.
9. Programs based on short, page, absolute addressing.
10. Interfacing 8259 – Interrupt Controller.
11. Interfacing 8279 – Keyboard Display.
12. Stepper motor control using 8253/8255.

II. Microcontroller 8051

Any 2 of the following experiments are to be conducted:

13. Reading and Writing on a parallel port.
14. Timer in different modes.
15. Serial communication implementation.
16. Understanding three memory areas of 00 – FF (Programs using above areas) using external Interrupts.

EQUIPMENT REQUIRED FOR LABORATORY

1. MASM/TASM software.
2. 8086 Microprocessor.

Kits

1. 8051 Micro Controller kits.
2. Interfaces/peripheral subsystems.
   i) 8259 PIC
   ii) 8279-KB/Display
   iii) 8255 PPI
   iv) 8251 USART
   4. A/D and D/AC Interface.

III B.TECH II -SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	-	-	-	-
QUANTITATIVE APTITUDE AND REASONING – II							

Course Objectives:

1. To train students in analyzing real life scenarios considering all factors
2. To educate the students on principles of mathematical problems and problem solving methods
3. To train students for campus placements

Course Outcomes:

After completion of this course, Students will be able to

1. Prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements.
2. Evaluate various real life situations by resorting to Analysis. of key issues and factors.
3. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

UNIT I: Numbers, Time and Distance, Time and work,Averages, Mixtures and Allegations

1. Numbers

a) Classification of numbers
b) Divisibility rules
c) Finding the units digit
d) Finding remainders in divisions involving higher powers
e) LCM and HCF Models

2. Time and Distance

a) Relation between speed, distance and time
b) Converting km/h into m/s and vice versa
c) Problems on average speed
d) Problems on relative speed
e) Problems on trains
f) Problems on boats and streams
g) Problems on circular tracks
h) Problems on races

3. Time and Work

a) Problems on Unitary method
b) Relation between Men, Days, Hours and Work
c) Problems on Man-Day-Hours method
d) Problems on alternate days
e) Problems on Pipes and Cisterns

4. Averages, Mixtures and Allegations

a) Definition of Average
b) Rules of Average
c) Problems on Average Problems on Weighted Average
d) Finding average using assumed mean method

e) Problems on mixtures
f) Allegation rule
g) Problems on Allegation

UNIT II: Data Interpretation, Data Sufficiency, Mensuration, Permutation and Combinations, Probability

1. Data Interpretation

a) Problems on tabular form
b) Problems on Line Graphs
c) Problems on Bar Graphs
d) Problems on Pie Charts

2. Data Sufficiency

a) Different models in Data Sufficiency
b) Problems on data redundancy

3. Mensuration

a) Formulas for Areas
b) Formulas for Volumes of different solids
c) Problems on Areas
d) Problems on Volumes
e) Problems on Surface Areas

4. Permutation and Combinations

a) Definition of permutation
b) Problems on Permutations
c) Definition of Combinations
d) Problems on Combinations

a) **Probability** Definition of Probability
b) Problems on coins
c) Problems on dice
d) Problems on Deck of cards
e) Problems on Years

SYLLABUS FOR REASONING

UNIT III: Cubes, Venn diagrams, Binary Logic

a) **Cubes**
b) Basics of a cube
c) Formulae for finding volume and surface area of a cube
d) Finding the minimum number of cuts when the number of identical pieces are given
e) Finding the maximum number of pieces when cuts are given
f) Problems on painted cubes of same and different colors
g) Problems on cuboids
h) Problems on painted cuboids
i) Problems on diagonal cuts

Venn diagrams

a) Representing the given data in the form of a Venn diagram

b) Problems on Venn diagrams with two sets
c) Problems on Venn diagrams with three sets
d) Problems on Venn diagrams with four sets

a) **Binary Logic**
b) Definition of a truth-teller
c) Definition of a liar
d) Definition of an alternator
e) Solving problems using method of assumptions
f) Solving analytical puzzles using binary logic

UNIT IV: Number and letter series, **Number and letter Analogies, Odd man out**

1. Number and letter series

a) Difference series
b) Product series
c) Squares series
d) Cubes series
e) Alternate series
f) Combination series
g) Miscellaneous series
h) Place values of letters

a) **Number and Letter Analogies**
b) Definition of Analogy
c) Problems on number analogy
d) Problems on letter analogy
e) Problems on verbal analogy

2. Odd man out

a) Problems on number Odd man out
b) Problems on letter Odd man out
c) Problems on verbal Odd man out

UNIT V: Coding and decoding, Direction sense, Critical Reasoning, Lateral reasoning puzzle

a) **Coding and decoding**
b) Coding using same set of letters
c) Coding using different set of letters
d) Coding into a number

1. Problems on R-model

a) **Direction sense**
b) Solving problems by drawing the paths
c) Finding the net distance travelled
d) Finding the direction
e) Problems on clocks
f) Problems on shadows
g) Problems on damaged compass
h) Problems on direction sense using symbols and notations

2. Critical Reasoning

a) Problems on assumption
b) Problems on conclusions
c) Problems on inferences
d) Problems on strengthening and weakening of arguments
e) Problems on principle
f) Problems on paradox

3. Lateral reasoning puzzle

a) Problems on common balance
b) Problems on digital balance
c) Problems on coins
d) Problems on lockers
e) Problems on heights
f) Digit puzzles using basic arithmetic operations

Text Books:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, 'Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude – Abhijit Guha Mc Graw Hills

References:

1. www.affairscloud.com/**quantitative-aptitude**-questions
2. www.careerafter.com/rs-aggarwal-**quantitative-aptitude**-pdf/
3. www.amazon.in/**Quantitative**-**Aptitude**-Competitive-Examinations.../8121924987
4. www.indiabix.com
5. www.practice**aptitude**tests.com/numerical-**reasoning**-test.

IV B.TECH I SEMESTER

IV B.TECH. - I SEMESTER COURSE STRUCTURE

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Power System Operation and Control	PC	3	1	-	40	60	100	3
2	Switchgear and Protection	PC	3	1	-	40	60	100	3
3	Utilization of Electrical Energy	PC	3	1	-	40	60	100	3
4	Open Elective – II	OE	4	-		40	60	100	3
5	**Professional Elective - III** 1.Modern Control Systems 2.VLSI Design 3.Embedded Systems 4.Power Quality	PE	3	1	-	40	60	100	3
6	**Professional Elective - IV** 1.HVAC & DC Transmission 2.PLC and Automation 3.High Voltage Engineering 4.Optimization Techniques	PE	3	1	-	40	60	100	3
7	Power Systems and Simulation Lab	PC	-	-	3	25	50	75	2
8	Mini Project – II	PW	-	-	3	25	50	75	2
	Total		19	5	6	290	460	750	22

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER SYSTEM OPERATION AND CONTROL							

Course Objectives:

1. To understand optimal dispatch of generation with and without losses.
2. To study the optimal scheduling of hydro thermal systems.
3. To study the optimal unit commitment problem.
4. To study the modeling of turbine and generator.
5. To study the load frequency control for single and two area system
6. To understand the reactive power control and compensation of transmission lines.

Course Outcomes:

After completion of this course, Students will be able to

1. Exhibit knowledge of emerging trends in systems used for power system operation and control.
2. Compute optimal hydrothermal scheduling of Generators.
3. Understand the unit commitment problem.
4. Ability to model and design turbine and Automatic controller.
5. Create simple architectures for single area and two area load frequency control.
6. Understand reactive power control and line power compensation.

UNIT–I: Economic Operation of Power Systems

Characteristics of Thermal power stations: Heat rate curve – Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Generating costs at thermal plants-Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.

UNIT–II: Hydrothermal Scheduling

Optimal scheduling of Hydrothermal System**:** Hydro-thermal coordination-scheduling of Hydro units in Hydro-Thermal system-Long Term and short term Coordination– Short term hydrothermal scheduling Transmission loss neglected and considered-Advantages of Hydro-Thermal scheduling.

UNIT–III: Unit Commitment

Optimal unit commitment problem – Need for unit commitment – Cost function formulation-Constraints in unit commitment — Solution methods – Priority-list method – Dynamic programming – Numerical Problems.

UNIT IV: Load Frequency Control - I

Modeling of Governor: Mathematical modeling of Speed Governing System – Derivation of small signal transfer function – Block Diagram.

Modeling of Turbine: Turbine model, Block Diagram representation of Steam Turbines. Necessity of keeping frequency constant – Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response- Uncontrolled case.

UNIT–V: Load Frequency Control - II

Proportional plus Integral control of single area and its block diagram representation. Load frequency control of two area system – Steady state response – Uncontrolled case and controlled case – Tie–line bias control- Load Frequency Control and Economic dispatch control.

UNIT–VI: Reactive Power Control

Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation –Specifications of load compensator – Uncompensated and compensated transmission lines: Shunt and series compensation.

Text Books:

1. Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata Mc Graw – Hill Publishing Company Ltd, 2nd edition.
2. Operation and Control in Power Systems – by P.S.R. Murthy, B.S. Publications.
3. Power System stability & control, Prabha Kundur, TMH

Reference Books:

1. Power System Analysis and Design by J. Duncan Glover and M. S. Sarma, THOMPSON, 3rd Edition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Operation by Robert H. Miller , James H. Malinowski,Tata McGraw Hill, 3rd Edition
4. Power System Analysis by Hadi Saadat – TMH Edition.

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
SWITCHGEAR AND PROTECTION							

Course Objectives:

1. To provide the basic principles of arc interruption, circuit breaking principles, operation of various types of circuit breakers.
2. To study the classification, operation, construction and application of different types of electromagnetic protective relays.
3. To explain various types of faults in generators and transformers and different types of protective schemes, to impart knowledge of various protective schemes used for feeders and bus bars.
4. To explain the principles and operations of different types of static relays, to study different types of over voltages in a power system and principles of different protective schemes for insulation coordination.

Course Outcomes:

After completion of this course, Students will be able to

1. Understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF6 gas type.
2. Understand the working principle and constructional features of different types of electromagnetic protective relays.
3. Acquire in depth knowledge of faults that is observed to occur in high power generator and transformers and protective schemes used for all protections.
4. Improves the ability to understand various types of protective schemes used for feeders and bus bar protection.
5. Generates understanding of different types of static relays with a view to application in the system.
6. Understand the different types of over voltages appearing in the system, including existing protective schemes required for insulation co–ordination.

UNIT-I: Circuit Breakers

Principle of operation – RRRV – Current chopping- Circuit Breaker ratings and specifications- Description and operation of Minimum oil Circuit Breaker- Air blast circuit breaker - SF_6 CB- Vacuum Circuit Breakers.

UNIT-II: Protective Relays

Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays- Relays Classification - Instantaneous, DMT and IDMT types - Application of relays - Over current, under voltage, Directional, Differential and Percentage Differential. Universal Torque Equation - Distance relays: Impedance, Reactance, Mho and Off-Set Mho relays with Characteristics.

UNIT-III: Protection of Generator, Transformer

Protection of Generators against Stator faults, Rotor faults, and Abnormal Conditions - Restricted Earth Fault - Numerical Problems on % Winding Unprotected.

Percentage Differential Protection of transformers - Numerical Problems on Design of CT's Ratio - Buchholtz Relay Protection.

UNIT-IV: Protection of Lines and Bus bars

Protection of Lines - Over Current, Carrier Current and Three-zone Distance Relay Protection using Impedance Relays - Translay Relay.Protection of Bus bars – Differential protection

UNIT-V: Grounding Techniques and Over Voltage Protection

Grounded and Ungrounded Neutral Systems- Effects of Ungrounded Neutral on system performance- Methods of Neutral Grounding - Arcing Grounds and Grounding Practices.

Protection against Over Voltages- Volt-Time Characteristics- Horn gap- Rod gap- Valve type and Zinc-Oxide Lighting Arresters.

UNIT-VI: Static and Microprocessor based Relays

Static Relays - Static Relays versus Electromagnetic Relays- Static distance relays. Microprocessor based distance relays - impedance, reactance, Mho & offset Mho, generalized mathematical expression for distance relay.

Text Books:

1. Sunil S Rao, "Switchgear Protection and Power Systems", Khanna Publishers, New Delhi, 11th Edition reprint 3rd Edition, 2008
2. Badri Ram, Viswakarma. D.N. "Power System Protection and Switchgear", MGH Publications, 2nd Edition 2011.

Reference Books:

1. B.L. Soni, Gupta, Bhatnagar, Chakrabarthy, "A Text book on Power System Engineering", DhanpatRai& Co, 2008.
2. C R Mason, "Art& Science of Protective Relaying", Wiley Eastern Ltd .

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
UTILIZATION OF ELECTRICAL ENERGY							

Course Objectives:

1. To understand the operating principles and characteristics of traction motors withrespect to speed, temperature, loading conditions.
2. To acquaint with the different types of heating and welding techniques.
3. To study the basic principles of illumination and different types of lightning system including design.
4. To understand the basic principle of electric traction including speed–time curves of different traction services.

Course Outcomes:

After completion of this course, Students will be able to

1. Identify a suitable motor for electric drives and industrial applications
2. Identify most appropriate heating or welding techniques for suitable applications.
3. Understand various level of luminosity produced by different illuminating sources.
4. Estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view.
5. Determine the speed/time characteristics of different types of traction motors.
6. Understand the terms Tractive effort and Coefficient Adhesion.

UNIT – I: Selection of Motors

Choice of motor-Types of electric drives-Starting and running characteristics–Speed control–Temperature rise–Applications of electric drives–Types of industrial loads–continuous–Intermittent and variable loads–Load equalization.

UNIT – II: Electric Heating& Welding

Advantages and methods of electric heating–Resistance heating-Direct & Indirect type- Arc furnaces – Direct and indirect arc furnaces-Induction heating-Core type & Coreless-Dielectric heating –Electric welding–Resistance and Arc welding–Electric welding equipment–Comparison between AC and DC Welding.

UNIT – III: Illumination-I

Introduction- terms used in illumination–Laws of illumination–Polar curves–Integrating sphere–Lux meter–Discharge lamps, MV and SV lamps – Lumen or flux method of calculation - Sources of light.

UNIT – IV: Illumination-II

Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Types and design of lighting and flood lighting–LED lighting - principle of operation - street lighting and domestic lighting – Numerical Problems.

UNIT – V: Electric Traction – I

System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed– time curves for different services – Trapezoidal and quadrilateral speed time curves-High speed transportation trains-Numerical Problems.

UNIT – VI: Electric Traction – II

Calculations of tractive effort– power –Specific energy consumption for given run–Effect of varying acceleration and braking retardation–Adhesive weight and braking-retardation adhesive weight and coefficient of adhesion–Numerical Problems.

Text Books:

1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Utilization of Electrical Energy – by G.C.Garg Khanna Publications.
3. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai& Sons.

Reference Books:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V. Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
MODERN CONTROL SYSTEMS (Professional Elective-III)							

Course Objectives:

1. To provide knowledge on design in state variable form
2. To provide knowledge in phase plane analysis.
3. To give basic knowledge in describing function analysis.
4. To study the design of optimal controller.

Course Outcomes:

After completion of this course, Students will be able to

1. Analyze the characteristics of zero order system
2. How to design in state variable form.
3. Know various non-linear systems and linearization methods.
4. Analyze of nonlinear system using the describing function technique and phase plane analysis
5. Know how to design an optimal controller.
6. Formulate and solve the LQR problem and Riccatti equation.

UNIT-I: Introduction to Signal Processing

Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Review of discrete-time signals and systems – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

UNIT-II: Analysis of Control System in State Space

Introduction to state Model- Eigen Values-Similarity Transformation- Cayley – Hamilton theorem-Transformation of State model-Canonical and Jordan canonical form of state models.

UNIT-III: Controllability, Observability

State Space Representation of discrete time systems – State transition matrix and methods of evaluation Tests for controllability and Observability for continuous time systems (Kalman's test and gilbert test) – Principle of duality – Controllability and Observability form Jordan canonical form.

UNIT-IV: Phase Plane Analysis

Features of linear and non-linear systems – Common physical non-linearities- Describing Functions: Dead Zone- Saturation- Backlash- Dead Zone and Saturation – Dead zone and Hysteresis-Phase Plane and Phase portrait–Singular points - Construction of phase portraits by Isocline method.

UNIT-V: Optimal Control

Linear quadratic optimal regulator (LQR) problem formulation – Optimal regulator design by parameter adjustment (Lyapunov method) – Optimal regulator design by continuous time algebraic riccatti equation (CARE) - Optimal controller design using LQG framework.

UNIT- VI: State Feedback Controllers

Design of state feedback controller through pole placement – Necessary and sufficient conditions – State observers - Ackerman's formula.

Text Books:

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996
2. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998
3. Advanced Control Theory – by A. Nagoor Kani, RBA Publication, Second Edition.

Reference Books:

1. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
2. Digital Control and State Variable Methods – by M. Gopal, Tata McGraw– Hill Companies, 1997.
3. Automatic Control Systems by B.C. Kuo, Prentice Hall Publication.

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
VLSI DESIGN (Professional Elective-III)							

Course Objectives:

1. Learn the various fabrication steps of IC and come across basic electrical properties of MOSFET.
2. Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect and to verify the functionality, timing, power and parasitic effects.
3. Learn the various subsystem designs and issues raised in the VLSI design.
4. Apply CMOS Testing- Logic level verification, Chip level Test Techniques, System-level Test Techniques.

Course Outcomes:

After completion of this course, Students will be able to

1. Recall the basic structural and electrical aspects of MOS transistors, architecture of FPGA and CPLD.
2. Compare the properties of NMOS, PMOS, CMOS and Bipolar technologies.
3. Develop the basic logic circuits using MOSFETs
4. Explain the pass transistor, inverters, Latch-up in CMOS circuits and scaling rules of MOS technology.
5. Build the sub systems like adders, 4 -bit processors and ALU.
6. Explain inverter delays, fan-in and fan- out, power calculation and clock mechanism in VLSI design and CMOS Testing.
7. Illustrate various design rules and design issues in the VLSI.

UNIT-I: Introduction

Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &BiCMOS Technologies; Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Comparison between CMOS and Bipolar technologies.

UNIT-II: Basic Electrical Properties

I_{ds} versus V_{ds} relationships, Aspects of MOS transistor Threshold Voltage, g_m, g_{ds}, and Figure of merit ωo. The Pass transistor, NMOS Inverter, various Pull-up to Pull-down Ratios for NMOS inverter. Alternative forms of pull-up, The CMOS Inverter, Bi-CMOS Inverter, Latch-up in CMOS circuits.

UNIT-III: VLSI Circuit Design Processes

MOS Layers, Stick Diagrams, Design Rules and Layout, 2μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT-IV: Basic Circuit Concepts

Sheet Resistance R_s and its concepts to MOS, Area Capacitance calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, choice of layers.

Sub system design: Architectural issues, switch logic, Gate logic, Subsystem Design Process: General Arrangement of 4-bit arithmetic processor, Design of an ALU subsystem.

UNIT-V: VLSI Design Issues

VLSI Design issues and design trends, design process, design for testability, technology options,

power calculations, package selection, clock mechanisms, mixed signal design, ASIC design flow, FPGA design flow, Basic FPGA architecture, basic CPLD architecture comparison of FPGA, ASIC and CPLD.

UNIT-VI: CMOS Testing

CMOS Testing, Need for testing, Test Principles, Logic level verification, Design Strategies for test, Chip level Test Techniques, System-level Test Techniques.

Text Books:

1. Kamran Eshraghian, EshraghianDougles and A. Pucknell "Essentials of VLSI circuits and systems" PHI, 2005 Edition.
2. Weste and Eshraghian "Principles of CMOS VLSI Design" Pearson Education, 1999.
3. VLSI Design-Black Book, Kogent Learning Solutions Inc.2012 Edition.

Reference Books:

1. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
3. VLSI Design – A.Albert Raj, Latha, PHI, 2008.

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
EMBEDDED SYSTEMS (Professional Elective-III)							

Course Objectives:

1. To gain knowledge on fundamental concepts, Firmware and Hardware components of embedded system.
2. To learn about different communication interfaces, characteristics and quality attributes of embedded system.
4. To understand the concepts of operating systems and embedded development tools.

Course Outcomes:

After completion of this course, Students will be able to

1. Illustrate the classification and Characteristics of embedded systems.
2. Recall the basic passive components and core of embedded systems.
3. Summarize various Communication interface in Embedded Systems.
4. Explain the RTOS basics and various Communication &Synchronization techniques.
5. Interpret the IDE and utility tools required to design embedded systems.
6. Demonstrate the application specific and domain specific embedded systems.

UNIT–I: Introduction

What is an embedded system? Embedded Systems vs. general computing systems, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems. Characteristics, Quality Attributes and Examples of Embedded Systems.

UNIT–II: Typical Embedded System

Core of the embedded system: general purpose and domain specific processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS).Communication Interface: onboard and external Communication Interfaces

UNIT–III: Embedded Hardware Design

Analog and Digital electronic Components, I/O types, reset circuit, brown-out protection circuit, oscillator unit, Real Time Clock (RTC), watchdog timer, PCB and passive components.

UNIT–IV: Embedded Firmware Design

Embedded firmware design approaches, embedded firmware development languages, ISR concept, Interrupt sources, ISR mechanism, Multiple Interrupts, DMA, Device driver programming, Concept of Embedded C language.

UNIT–V: Embedded System Development

The integrated development Environment, types of files generated by compilers, Deassembler / Decompiler, Simulator, Emulators and Debugging tools, Target hardware debugging, Software utility tools, Laboratory tools.

UNIT–VI: RTOS Based Embedded System Design

Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling, Communication, Synchronization.

Text Books:

1. Shibu K.V, “Introduction to Embedded Systems”, Mc Graw Hill Education, 2013.
2. Raj Kamal, “Embedded Systems”, TMH.
3. Labrosse “Embedded Systems building blocks” CMP publishers

Reference Books:

1. Frank Vahid, Tony Givargis,”Embedded System Design”, John Wiley.
2. Lyla, “Embedded Systems”, Pearson, 2013
3. David E. Simon, “An Embedded Software Primer”, Pearson Education.

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER QUALITY (Professional Elective-III)							

Course Objectives:

1. To learn different types of power quality phenomena.
2. To identify sources for voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
3. To describe power quality terms and study power quality standards.
4. To learn the principle of voltage regulation and power factor improvement methods, distributed generation and power quality.

Course Outcomes:

After completion of this course, Students will be able to

1. Understand the power quality issues in electrical distribution network.
2. Evaluate the severity of voltage sag, voltage swell, harmonics, and transients in distribution networks.
3. Understand the methods to improve the power quality.
4. Design circuits to mitigate power quality issues.
5. Demonstrate the relationship between distributed generation and power quality.
6. Understand the Power quality monitoring, considerations and Application of intelligent systems

UNIT–I: Introduction

Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long– duration voltage variations – Short–duration voltage variations – Voltage Unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations.

UNIT–II: Voltage Interruptions in Power Systems

Power quality terms – Voltage sags & interruptions –Sources of voltage sag, Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients.

UNIT–III: Voltage Regulation and Power Factor Improvement

Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End–user capacitor application – Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.

UNIT– IV: Harmonic Distortion and Solutions

Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters – Point of common coupling – Passive and active filtering – Numerical problems.

UNIT–V: Distributed Generation and Power Quality

Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts – DG on low voltage distribution networks.

UNIT–VI: Monitoring and Instrumentation

Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Text Books:

1. Electrical Power Systems Quality, Dugan R C, Mc Granaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.
2. Electric power quality problems –M.H.J. Bollen IEEE series-Wiley india publications, 2011.
3. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.

Reference Books:

1. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
2. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
3. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
4. Power Quality c.shankaran, CRC Press, 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis).
6. Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum - Elsevier.

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
HVAC&DC TRANSMISSION (Professional Elective-IV)							

Course Objectives:

1. To understand the phenomena associated with transmission line, operating at extra high voltages. The unit gives detail analysis of several phenomena viz. electrostatic field, charges, voltage gradient and conductor configuration.
2. The objective is to discuss phenomena of corona, losses, audible noise, radio interference and measurement of these quantities.
3. To understand the phenomena of HVDC, HVDC equipment comparison with AC and the latest state of art in HVDC transmission.
4. To understand method of conversion of AC to DC, performance of various level of pulse conversion and control characteristics of conversion. It also provides knowledge of effect of source inductance as well as method of power control.

Course Outcomes:

After completion of this course, Students will be able to

1. Design the voltage level and ratings of the HVDC system for a given amount of power transfer.
2. Identify the suitable converter and its control scheme in HVDC Transmission.
3. Estimate the amount of reactive power to be compensated for a given HVDC Transmission system.
4. Develop a suitable model for a given AC- DC network.
5. Choose appropriate protecting device for various faults in HVDC stations.
6. Design a suitable filter to eliminate harmonics in the HVDC System.

UNIT – I: Basic Concepts

Introduction of EHV AC transmission

Necessity of EHV AC transmission – Advantages and problems – Power handling capacity and line losses – Mechanical considerations – Resistance of conductors –Electrostatics – Field of sphere gap – Field of line charges and properties – Charge ~ potential relations for multi–conductors – Surface voltage gradient on conductors – Bundle spacing and bundle radius – Examples – Distribution of voltage gradient on sub conductors of bundle –Examples.

UNIT – II: Corona effects

Power loss and audible noise (AN) – Corona loss formulae – Charge voltage diagram – Generation – Characteristics – Limits and measurements of AN –Relation between 1–phase and 3–phase AN levels – Examples – Radio interference (RI) – Corona pulses generation – Properties and limits –Frequency spectrum – Modes of propagation – Excitation function –
Measurement of RI, RIV and excitation functions – Examples.

UNIT – III: Basic Concepts of DC Transmission

Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for VDC Systems – Comparison of AC &DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C. Transmission.

UNIT – IV: Analysis of HVDC Converters and System Control

Choice of Converter configuration – analysis of Graetz – characteristics of 6 Pulse & 12 Pulse converters –Cases of two 3 phase converters in star –star mode – their performance. Principal of

DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system; Starting and stopping of DC link; Power Control.

UNIT – V: Reactive Power Control in HVDC

Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies sources of reactive power-AC Filters – shunt capacitors-synchronous condensers.

UNIT-VI: Harmonics and Filters

Generation of Harmonics –Characteristics harmonics, calculation of AC Harmonics, Non-Characteristics harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics. Types of AC filters, Design of Single tuned filters –Design of High pass filters.

Text Books:

1. HVDC Power Transmission Systems: Technology and system Interactions – by .R.Padiyar, New Age International (P) Limited Publishers, First Edition, 2005.
2. EHVAC and HVDC Transmission Engineering and Practice – S.Rao. Khanna Publishers, 1990.

Reference Books:

1. HVDC Transmission – J.Arrillaga. published by the institution of electrical engineering, London, UK, 1998.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons, First Edition.
3. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications, First Edition.

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
PLC AND AUTOMATION (Professional Elective-IV)							

Course Objectives:

1. To introduce the basic concepts of programmable logic controllers and its applications.
2. To familiarize the students in programming formats and construction of PLC ladder diagrams.
3. To Study PLC functions, Data handling functions and controlling of two axes and three axes Robots with PLC.
4. To Study Analog PLC operation and different examples.

Course Outcomes:

After completion of this course, Students will be able to

1. Describe the Characteristics of Registers, module addressing, holding registers, input registers, output registers and determine its importance in Ladder diagram.
2. Apply the knowledge of programming formats for construction of PLC ladder diagrams in Boolean algebra systems.
3. Develop ladder diagrams for process control.
4. Describe the Analog modules and systems, Analog signal processing, multi bit data processing.
5. Understand various Industrial applications of PLC.
6. Understand PID principles, tuning and functions.

UNIT-I: PLC Basics

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

UNIT-II: PLC Programming

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

UNIT-III: PLC Registers

Characteristics of Registers, module addressing, holding registers, input registers, output registers.

UNIT-IV: PLC Functions

PLC Functions: Timer functions and Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions.

UNIT-V: Data Handling Functions

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

UNIT-VI: Analog PLC Operation

Analog modules and systems, Analog signal processing, multi bit data processing, analog output

application examples, PID principles, position indicator with PID control, PID modules, PID tuning, PID functions.

Text Books:

1. Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI.
2. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.

Reference Books:

1. Programmable Logic Controllers Hardware and Programming by Max Rabiee Goodheart-Wilcox.
2. Programmable Logic Controllers by Frank D. Petuzeela McGraw-Hill.
3. Industrial Automation and Process control by Jon Stenerson Prentice-Hall.

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
HIGH VOLTAGE ENGINEERING (Professional Elective-IV)							

Course Objectives:

1. To understand electric field distribution and computation in different configuration of Electrode systems and HV breakdown phenomena in gases, liquids and solids dielectric materials.
2. To acquaint with the generating principle of operation and design of HVDC, AC and Impulse Voltages and impulse currents.
3. To understand various techniques of AC, DC and Impulse measurement of high voltages and Currents.
4. To understand the insulating characteristics of dielectric materials and the various testing techniques of HV equipment.

Course Outcomes:

After completion of this course, Students will be able to

1. Estimate electric field intensity of different electrode configurations.
2. Understand the Breakdown mechanism of Gas, Liquid and solid insulation.
3. Acquire knowledge about the generation of high voltages and Impulse currents.
4. Acquire knowledge about the Measurement of high voltages and Impulse currents.
5. Understand the testing methods of high voltage equipment.
6. Design the insulation of HV power equipment.

UNIT–I: Introduction to High Voltage Technology

Electric Field Stresses- Estimation and control of electric Stress- Electric Field intensity- classification of Electric Fields- Uniform and non–uniform field configuration of electrodes- Numerical methods for electric field computation.

UNIT–II: Break down phenomenon in gaseous, liquid and solid insulation

Gases as insulating media - Collision process- Ionization process- Townsend's criteria of breakdown in gases- Paschen's law- Liquid as Insulator- Pure and commercial liquids- Breakdown in pure and commercial liquid- Intrinsic breakdown- Electromechanical breakdown- Thermal breakdown- Breakdown of solid dielectrics in practice – Breakdown in composite dielectrics used in practice.

UNIT–III: Generation of High voltages and High currents

Generation of High DC voltages: Half and full wave rectifier circuits- Voltage doublers circuits- Cockcroft Walton voltage multiplier circuit.

Generation of Hugh AC voltages: Electrostatic generator- Van de Graf generator- Cascaded transformers.

Generation of Impulse Voltages: Analysis of impulse generator circuit- Multistage Impulse generator circuit.

Generation of impulse currents: Definition of impulse current waveforms- circuit for producing impulse current waves.

UNIT–IV: Measurement of high voltages and High currents

Introduction- generating voltmeter- electrostatic voltmeter- sphere gap- uniform field spark gap- rod gap- resistive and capacitive voltage dividers- measurement of high DC- AC and impulse currents.

UNIT–V: Non–destructive testing of material and electrical apparatus

Measurement of DC resistivity: specimens and electrodes- loss of charge method- measurement of dielectric constant and loss factor- High voltage Schering Bridge.

Partial discharge measurements: Introduction- partial discharge phenomenon- discharges detection using straight detectors.

UNIT–VI: High voltage testing of electrical apparatus

Testing of overhead line insulators: Definitions- power frequency tests- impulse tests.Testing of isolators and circuit breakers: Introduction- short circuit tests.Testing of power transformers: Induced over voltage tests- partial discharge tests- impulse tests.Testing of surge arresters: power frequency spark over test- hundred percent standard impulse spark over test- front of wave spark over test- residual voltage test.

Text Books:

1. High Voltage Engineering by M.S. Naidu and V. Kamaraju – TMH Publications, 3rd Edition. Electrical and Electronics Engineering
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S. Zaengl, J. Kuffel by Elsevier, 2nd Edition.

Reference Books:

1. High Voltage Engineering by C.L. Wadhwa, New Age Internationals (P) Limited, 1997.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New. Age International (P) Limited, 1995.

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
OPTIMIZATION TECHNIQUES (Professional Elective-IV)							

Course Objectives:

1. To understand the basic concepts of optimization and classification of optimization problems.
2. To understand Transportation & Assignment Problems.
3. To understand different classical Optimization techniques, linear programming, unconstrained and constrained nonlinear programming.
4. To understand soft Computing methods GA & PSO

Course Outcomes:

After completion of this course, Students will be able to

1. Develop an objective function and obtain solution for multivariable optimization problem With equality/Inequality constraints
2. Apply different techniques to solve transportation and assignment problems.
3. Apply simulation techniques for problem solving
4. Apply nonlinear programming techniques for unconstrained/constrained optimization
5. Apply nonlinear programming techniques constrained optimization
6. Use soft computing techniques to solve optimization problems

UNIT-I: Linear Programming (LP)

Introduction to LP and formulation of Linear Programming problems- Graphical solution method- alternative or multiple optimal solutions- Unbounded solutions- Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming, Integer linear programming.

UNIT-II: Transportation & Assignment Problems

Introduction to Transportation problems-various methods of Transportation problem-Variations in Transportation problem-introduction to Assignment problems-variations in Assignment problems.

UNIT-III: Replacement & Maintenance Models

Replacement of items-subject to deterioration of items subject to random failure group vs. individual replacement policies.

Simulation: Introduction & steps of simulation method-distribution functions and random number generation.

UNIT- IV: Nonlinear Programming

Unconstrained cases - One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method – Uni variate method-Powell's method and steepest descent method.

UNIT-V: Constrained Cases

Characteristics of a constrained problem-Classification-Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods- Introduction to convex Programming Problem.

UNIT-VI: Dynamic Programming

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure-application from engineering. Evolutionary programming techniques- genetic Algorithm(GA) three parameters of GA- computational

procedure for both binary and analogue coded inputs-Illustrating the calculus method of solution - examples illustrating the tabular method of solution.

Text Books:

1. J K Sharma, Operations Research Theory and Applications, MacMillan India Ltd.
2. N D Vohra, Quantitative Techniques in management, Tata McGraw Hill

Reference Books:

1. Handy A Taha, Operations Research – An Introduction, Prentice Hall of India, New Delhi.
2. Wagner H M, Principles of Operations Research: With Applications to Management Decisions, Prentice-Hall of India, New Delhi.
3. Hillier F S and Lieberman G J, Operations Research, Holden Day Inc., San Francisco.
4. Payne T A, Quantitative Techniques for Management: A Practical Approach, Reston Publishing Co. Inc., Virginia.
5. Wilkes F M, Baum P and Smith G D, Management Science: An introduction, John Wiley and Sons, Santa Barbara.

IV B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
POWER SYSTEMS AND SIMULATION LAB							

Course Objectives:

1. To allow students to practically verify several concepts and procedures learned in power system modeling and analysis.
2. To develop hands-on experience of how certain procedures of power system operation are carried out.
3. To carry out system studies using state of the art power systems analysis software to assess system operation in steady state and under faulted conditions.
4. To promote teamwork among students and effective communication skills.

Course Outcomes:

After completion of this course, Students will be able to

1. Understand how to measure electrical parameters characteristics of a 3-phase transmission line.
2. Ability to simulate Rectifier, Chopper, Inverter and AC Voltage Controller.
3. Calculate the Load flow solution of power system by iterative methods
4. Perform dynamic stability analysis.

LIST OF EXPERIMENTS

Any 10 of the following experiments are to be conducted

1. Calibration of Tong Tester.
2. Determination Of Transmission Line Parameters
3. Sequence Impedance of 3-Φ Transformer.
4. Simulation of single - Phase full converter using RLE loads.
5. Simulation of single - Phase Inverter with PWM control.
6. Economic Load Dispatch with and without Losses.
7. Single Area Load frequency Control without and with PI Controller.
8. Load Flow solution by using Gauss-Seidel Method.
9. Solution to Swing Equation using Point-by-Point Method.
10. Simulation of single phase AC voltage controller using RLE loads.
11. Simulation of Buck chopper.
12. Simulation of Op-Amp based Integrator & Differentiator circuits.

IV B.TECH II SEMESTER

IV.TECH. - II SEMESTER COURSE STRUCTURE

S. No.	Subject	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Soft Computing Techniques to Electrical Engineering	PC	3	1	-	40	60	100	3
2	**Professional Elective – V** 1. FACTS 2.Power System Deregulation 3.SmartGrid 4.Switched Mode Power Converters	PE	3	1	-	40	60	100	3
3	Open Elective - III	OE	4	-	-	40	60	100	3
4	Practical Training / Internship	PW	-	-	-	40	60	100	3
5	Project Work	PW	-	-	-	80	120	200	10
	Total		10	2	-	240	360	600	22

IV B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
SOFT COMPUTING TECHNIQUES TO ELECTRICAL ENGINEERING							

Course Objectives:

1. To study various methods of AI, models and architecture of artificial neural networks.
2. To study the ANN paradigms.
3. To study the fuzzy sets operations and the fuzzy logic systems.
4. To study the applications of AI.

Course Outcomes:

After completion of this course, Students will be able to

1. Understand the Learning Process and Learning Task, Supervised Learning – Single and Multi-Layer Network.
2. Understand the back propagation networks and algorithm.
3. Apply the Fuzzy Sets and Membership Functions, Operations on Fuzzy Sets, Fuzzification, Fuzzy Numbers- Operations on Fuzzy Numbers, Fuzzy Relations.
4. Explain the Fuzzy Inference Systems- Architecture of Fuzzy Inference System, Fuzzy Inference Rules and Reasoning, Defuzzification, Applications of Fuzzy Logic.
5. Understand the Genetic algorithms and evolutionary computation, Applications of Genetic Algorithms.
6. Explain the applications of soft computing techniques.

UNIT-I: Artificial Intelligent Systems

Artificial Intelligent systems – Neural Networks, Fuzzy Logic. Artificial Neural Networks – Biological neural networks – Model of an artificial neuron- Comparison between biological neuron and artificial neuron– Basic models of artificial neural network –Learning methods – Activation function and Terminologies of ANN- Mc Culloch Pitts Neuron –Perceptron Networks.

UNIT-II: Back Propagation Networks

Back propagation Networks : Architecture - Multi layer perceptron –Back propagation Learning – Input layer- Hidden Layer - Output Layer computations- Calculation of error- Training of ANN- Back propagation Algorithm- Selection of various parameters in BP networks.

UNIT-III: Classical and Fuzzy Sets

Fuzzy verses crisp sets – Crisp sets – operations and properties of crisp sets- partition and covering- Fuzzy sets- membership function – operation and properties of fuzzy sets- crisp relations- Cartesian product- other crisp relations- operations on relations- fuzzy relations- fuzzy Cartesian product- operations on fuzzy relations.

UNIT-IV: Fuzzy Logic System Components

Crisp logic- laws of propositional logic- inference in propositional logic- fuzzy logic- fuzzy propositions- fuzzy connectives- fuzzy quantifiers- fuzzy inference- fuzzy rule base system- Defuzzification- Types of Defuzzification- fuzzy logic controller- components of FLC.

UNIT- V: Genetic Algorithms

Genetic Algorithms- Basic Concepts- Creation of off- springs- Working Principle- Encoding- Fitness function- Reproduction- Roulette- Wheel Selection, Boltzmann Selection- Tournament selection- Rank Selection- Cross Over- Inversion and deletion- Mutation Operator- Bitwise operators.

UNIT- VI: Applications to Electrical Engineering

Speed control of D.C and A.C motors- Reactive Power Control- Load Frequency Control- Economic load dispatch- load flow studies- Load forecasting.

Text Books:

1. S. N. Sivanandam, S. N. Deepa, Principles of Soft Computing, Wiley India Pvt. Ltd. [Module I& III]
2. R.Rajasekharan and G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms- Synthesis and Applications, Prentice Hall of India. [Module II, & IV]

Reference Books:

1. Fakhreddine O.Karray, Clarence De Silva, Intelligent Systems Design, Theory, Tools and Application, Pearson Education
2. S. Haykins, Neural Networks – A Comprehensive Foundation, Prentice Hall 2002.
3. L. Fausett, Fundamentals of Neural Networks, Prentice Hall 1994.
4. T.Ross, Fuzzy Logic with Engineering Applications, Tata McGraw-Hill, New Delhi 1995.
5. D.E. Goldberg, Genetic Algorithms in search, Optimization and Machine Learning, Addison Wesley MA, 1989.
6. John Yen, Reza Lengari, Fuzzy Logic- Intelligence, Control and Information, Pearson Education.

IV B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS
(Professional Elective-V)

Course Objectives:

1. To learn the basics of power flow control in transmission lines by using FACTS controllers
2. To explain the operation and control of voltage source converter.
3. To discuss compensation methods to improve stability and reduce power oscillations in the transmission lines.
4. To learn the method of shunt compensation by using static VAR compensators.
5. To learn the methods of compensation by using series compensators
6. To explain the operation of two modern power electronic controllers (Unified Power Quality Conditioner and Interline Power Flow Controller).

Course Outcomes:

After completion of this course, Students will be able to

1. Determine power flow control in transmission lines by using FACTS controllers.
2. Explain operation and control of voltage source converter.
3. Discuss compensation methods to improve stability and reduce power oscillations in the transmission lines.
4. Explain the method of shunt compensation by using static VAR compensators.
5. Appreciate the methods of compensations by using series compensators.
6. Explain the operation of modern power electronic controllers

UNIT–I: Introduction to FACTS

Need of transmission Interconnections-Power flow in an AC System – Loading capability limits – Dynamic stability considerations - Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices – Voltage and current rating – Losses and speed of switching.

UNIT–II: Voltage source and Current source converters

Concept of voltage source converter (VSC) – Single phase bridge converter – Squarewave voltage harmonics for a single phase bridge converter – Threephase full wave bridge converter– Basic concepts of Current sourced converters.

UNIT–III: Shunt Compensators–1

Objectives of shunt compensation – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.

UNIT–IV: Shunt Compensators–2

Methods of controllable VAR generation: Variable impedance type static VAR generators – Thyristor Controlled Reactor (TCR),Thyristor Switched Capacitor (TSC)– Thyristor Switched Capacitor – Thyristor Switched Reactor (TSC–TCR). Static VAR compensator (SVC) and Static Compensator (STATCOM)**:** The regulation and slope transfer function and dynamic performance.

UNIT V: Series Compensators

Static series compensators**:** Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. GTO thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) .

UNIT–VI: Combined Controllers

Schematic and basic operating principles of unified power flow controller (UPFC) and Interline power flow controller (IPFC) – Application of these controllers on transmission lines.

Text Books:

1. "Understanding FACTS" N.G. Hingorani and L.Guygi, IEEE Press. Indian Edition is available:—Standard Publications, 2001.

Reference Books:

1. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
2. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.Mohan Mathur and Rajiv K.Varma, Wiley.

IV B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER SYSTEM DEREGULATION (Professional Elective-V)							

Course Objectives:

1. To study fundamentals of power system deregulation and Restructuring
2. To study available transfer capability.
3. To study congestion management and various electricity pricing.
4. To study operation of power system in deregulated environment and importance of Ancillary services management.

Course Outcomes:

After completion of this course, Students will be able to

1. Describe importance of power system deregulation and restructuring.
2. Understand structure of OASIS and able to compute ATC.
3. Understand transmission congestion management.
4. Compute electricity pricing in deregulated environment.
5. Understand power system operation in deregulated environment.
6. Understand importance of ancillary services.

UNIT-I: Over View of Key Issues in Electric Utilities

Introduction – Restructuring models – Independent system operator (ISO) –Power Exchange – Market operations – Market Power – Standard cost –Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion.

UNIT-II: OASIS: Open Access Same–Time Information System

Structure of OASIS – Processing of Information – Transfer capability on OASIS – Definitions Transfer Capability Issues – ATC – TTC – TRM – CBM calculations – Methodologies to calculate ATC.

UNIT-III: Congestion Management

Introduction to congestion management – Methods to relieve congestion

UNIT-IV: Electricity Pricing

Introduction – Electricity price volatility electricity price indexes –Challenges to electricity pricing – Construction of forward price curves – Short–time price forecasting.

UNIT-V: Power system operation in competitive environment

Introduction – Operational planning activities of ISO – The ISO in pool markets – The ISO in bilateral markets – Operational planning activities of a Genco.

UNIT-VI: Ancillary Services Management

Introduction – Reactive power as an ancillary service – A review – Synchronous generators as ancillary service providers.

Text Books:

1. P.Venkatesh. B.V.Manikandan, S.Charles Raja- A.Srinivasan, “Electrical power systems: Analysis, security, Deregulation”– PHI 2012.
2. Mohammad Shahidehpour, MuwaffaqAlomoush, Marcel Dekker, “Restructured electricalpower systems: operation, trading and volatility” Pub., 2001.

Reference Books:

1. Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boolen, "Operation of restructured power systems", Kluwer Academic Pub., 2001.
2. Sally Hunt, "Making competition work in electricity", John Willey and Sons Inc. 2002.
3. Steven Stoft, "Power system economics: designing markets for electricity", John Wiley & Sons, 2002.

IV B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
SMART GRID (Professional Elective-V)							

Course Objectives:

1. To understand the concept of Smart Grid, compare with conventional grid, and identify its opportunities and barriers.
2. To understand the concept of Smart Meter, Smart Appliances, Automatic Meter Reading, Outage Management System, Plug in Hybrid Electric Vehicles, Vehicle to Grid, Smart Sensors, Home & Building Automation, and Phase Shifting Transformers.
3. To understand the concept of Substation Automation, Feeder Automation. Intelligent Electronic Devices, Smart storage like Battery, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System, and Phase Measurement Unit.
4. To understand the concept of micro grid, Power Quality Management in Smart Grid and the smart grid with communication system.

Course Outcomes:

After completion of this course, Students will be able to

1. Differentiate Conventional and Smart Grid.
2. Identify the need of Smart Grid, Micro Grid, Smart metering, and Smart storage, Hybrid Vehicles, Home Automation and Smart Communication.
3. Get introduced to new upcoming concepts in electrical from Utility to Consumers.
4. Able to Remember the concept of Micro grid
5. Comparing and getting acquainted with emerging technologies and current professional issues in electric Grid.
6. Express the necessity of global smart communication system.

UNIT -I: Introduction to Smart Grid

Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Drivers of Smart Grid in India, Challenges for Smart Grid, Difference between conventional & smart grid, Smart Grid Vision & Roadmap for India, , Present development & Pilot projects in India.

UNIT-II: Smart Grid Technologies

Remote Terminal Unit (RTU), Intelligent Electronic Devices (IED), Smart Substations, Substation and Feeder Automation, application for monitoring, protection and control, Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid (V2G), Grid to vehicles (G2V), Smart storage technologies – Battery (flow and advanced), SMES,.

UNIT-III: Smart Meters and Advanced Metering Infrastructure

Introduction to smart meters advanced metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, phase measurement unit (PMU), intelligent electronic devices (IED) & their application for monitoring and protection.

UNIT-IV: Micro Grid

Concept of Micro Grid, need & applications of Micro Grid, Micro Grid Architecture, DC Micro Grid, Formation of Micro Grid, Issues of interconnection, protection & control of Micro Grid, Integration of renewable energy sources, Smart Micro Grid, Micro Grid and Smart Grid Comparison.

UNIT-V: Power Quality Management in Smart Grid

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

UNIT-VI: Communication Technology for Smart Grid

Communication Architecture of Smart Grid, Wide Area Measurement System (WAMS), Home Area Network (HAN), Neighbour hoods Area Network (NAN), Wide Area Network (WAN). Bluetooth, GPS, Wi-Fi based communication.

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai "Integration of Green and Renewable Energy in Electric Power Systems", Wiley.
2. JanakaEkanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Smart Grid, Wiley Publications, 2012.
3. James Momoh, Smart Grid: Fundamentals of Design and Analysis, Wiley IEEE Press, 2012.

Reference Books:

1. Raj Samani, Applied Cyber Security and the Smart Grid, Syngress Publishers, 2012.
2. Peter S. Fox Penner, "Smart Power: Climate Changes, the Smart Grid, and the Future of Electric Utilities", Island Press; 1st edition 8 Jun 2010
3. S.Chowdhury, S. P. Chowdhury, P. Crossley, "Micro grids and Active Distribution Networks." Institution of Engineering and Technology, 30 Jun 2009.
4. Nikos Ziargyriour, "Micro grid, Architecture and Control", IEEE Press, Wiley Publications.

IV B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
SWITCHED MODE POWER CONVERTERS (Professional Elective-V)							

Course Objectives:

1. Understand the different types of converters, and their power circuit with the steady state analysis of Buck-Boost and fly back converter.
2. Understand the soft switching techniques and series, parallel and concepts of ZVS and ZCS circuits.
3. Understand and classify types of power supply, overview of the power supplies and control of the switch mode DC supplies
4. Understand the design considerations of converters, Inductors, capacitors and Transformer design.

Course Outcomes:

After completion of this course, Students will be able to

1. Understand the concepts, power circuit and steady states analysis of converters
2. Understand the concepts isolated bridges and steady state analysis and soft switching techniques
3. Understand the concepts of resonant circuit parallel, series and types of ZVS
4. Understand the concepts of ZCS and L, M types of ZCS with their performance characteristics.
5. Understand and remembering of the Applications of power supply and control of switch mode DC Supplies
6. Understand the design considerations of practical converter like inductor and capacitor and Transformer.

UNIT-I: DC-DC Switch-Mode Converters

Introduction- Basic concepts- Control of DC-DC converters- Buck converter –Continuous , discontinuous mode- Boundary between the modes- Boost converter- Continuous , discontinuous mode - Cuk DC-DC converter - Full bridge DC-DC converter- DC-DC converter comparison.

UNIT – II: DC-AC Switch-Mode Converters

Introduction- Basic concepts of switch mode inverters- PWM switching scheme- square wave switching scheme- Single phase inverters:-single phase half bridge- single phase full bridge- push-pull inverters- switch utilization in single phase inverters- Three phase inverters- other inverters switching schemes.

UNIT – III: Resonant Converters-I

Introduction-Classification of Resonant converters-Basic resonant circuits- Series resonant circuit-parallel resonant circuits- Concept of Zero current switching- principle of operation- analysis of M-type and L-type Buck or boost Converters.

UNIT – IV: Resonant Converters-II

Concept of Zero voltage switching- principle of operation- analysis of Two Quadrant ZVS resonant Converters- ZVS-CV Topologies- Resonant Dc Link converter with ZVS.

UNIT – V: Power Supply Applications

Introduction- Linear power supplies- overview of switching power supplies- DC-DC converter with Electrical isolation- control of switch mode DC Power supplies- power supply protection- Electrical isolation in the Feedback Loop- Designing to meet the power supply specification.

UNIT-VI: Practical Converter Design Considerations

Introduction- Design of Inductors- Transformer design- selection of capacitors, Resistors-Current measurements- Heat sinking- Circuit Layout.

Text Books:

1. Fundamentals of Power Electronics – Robert Erickson and Dragon Maksivimovic, Springer Publications.
2. Power Electronics by mohan, undeland and robbins, Wiley & sons publications

Reference Books:

1. Elements of Power Electronics - Philip T.Krein – Oxford University Press
2. Power Electronics, L. Umanand, Tata Mc-Graw Hill
3. Power Electronics–IssaBatarseh- John Wiely