DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ACADEMIC REGULATIONS & SYLLABI (R-22)

B.Tech

Electrical and Electronics Engineering

w.e.f. the Academic Year 2022-2023

Vidya Jyothi Institute of Technology
(An Autonomous Institution)
(Accredited by NAAC A+ Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)Aziz Nagar Gate, C.B. Post, Hyderabad-500 075

ACADEMIC REGULATIONS

(R-22)

For the

Bachelor of Technology

(B. Tech)

With effect from the Academic year 2022-23

1 VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

Aziznagar Gate, Chilkur Balaji Road,

Hyderabad,Telangana - 500075

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1.1 Definitions of Key Words

Academic Year: An academic year is referred to as the period consisting of two consecutive semesters, each with 16 -18 weeks (90 instructional days) followed by semester examinations.

Course: A plan of study of a particular subject leading to an examination. All the courses need not carry the same weightage. A course may be designed to comprise of lectures/ tutorials/ laboratory work/ field work/ outreach activities/ project work/viva/ seminars/ assignments/ presentations etc. or a combination of some of these.

Choice Based Credit System (CBCS): Choice Based Credit System (CBCS) is the programme in which the students have a choice to choose from the prescribed courses and the entire assessment is graded based on a credit system.

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C and F.

Grade Point: It is a numerical weight allotted to each letter Grade on a 10-point scale.

Credit: A unit of measurement of course work. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/ field work per week.

Credit Point: It is the product of Grade Point and Number of Credits for a course.

Semester Grade Point Average (SGPA): SGPA stands for Semester Grade Point Average, a score awarded to students based on how well they have fared in their course work at the end of each semester .It is the ratio of total credit points secured by a student in the courses registered in a semester and the total course credits of that semester. It shall be expressed up to 2nd decimal place.

Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student in all the semesters. CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to 2nd decimal place.

Programme: An Educational Programme leading to the award of a Degree.

1.1.1 B. Tech. with Minor degree:

A student will be eligible to get B. Tech. with Minor Degree, if he/she acquires 18 additional credits.These should be acquired through registered courses offered by the Institution or through MOOCs as equivalent to the courses offered by the Institute.

1.1.2 B.Tech(Honors)

The B. Tech. (Honors) programs are proposed to choose for an area of specialization among various emerging technologies in order to be a domain expert. A student will be eligible for B. Tech. (Honors) Degree, if he/she acquires an additional 20 credits. These should be acquired through registered courses as per the respective courses offered by the Department/Institute or through SWAYAM MOOCs as equivalent to the courses offered by the Institute.

Transcript or Grade Card: Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade card will be displaying the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

Types of Courses: The Courses in/under B. Tech Program may be of three kinds' viz., Core, Elective and Mandatory.

a) Core Course: -

There may be a Core Course in every semester and are to be compulsorily studied by a student and is essential requirement for a given Programme.

b) Elective Course: -

Elective Course is a course which can be chosen by the students from a pool of Courses. In general, the elective course is:

- Supportive to the discipline of study
- Provides an expanded scope of the core courses
- Nurtures student's proficiency/skill

In case an elective is "Discipline centric" and is offered by the student's department itself, the elective is called **Professional elective**. On the contrary, if the elective is offered by other departments wherein the students are at liberty to choose a course of their interest, the elective is called an "**Open Elective**."

c) Mandatory Courses (Non-Credit Courses)

AICTE considers that the Course work pertaining to certain subjects is essential and a' **pass** in those subjects is compulsory as such for the award of B.Tech degree. Such types of courses are referred to as Mandatory **courses**. As AICTE feels that familiarity with the subject content of these courses is sufficient, but essential, only a pass in each of these courses is required. Therefore, these subjects are included in the curriculum as non-Credit courses.

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

Aziznagar Gate, C.B. Post, Hyderabad - 500 075, Telangana

ACADEMIC REGULATIONS FOR B.Tech.

WITH EFFECT FROM ACADEMIC YEAR 2022-23 (R22)

1 Under-Graduate Degree Programme in Engineering: Vidya Jyothi Institute of Technology offers a 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree programme, under Choice Based Credit System (CBCS) in the following Branches of Engineering.

S. No	Branch
1.	Civil Engineering
2.	Electrical and Electronics Engineering
3.	Mechanical Engineering
4.	Electronics and Communication Engineering
5.	Computer Science and Engineering
6.	Information technology
7.	Artificial Intelligence
8.	Computer Science and Engineering (Data Science)
9.	Artificial Intelligence &Data Science
10.	Computer Science & Engineering(AI&ML)

Regulations applicable to any new courses introduced in later years

2 ELIGIBILITY FOR ADMISSION

2.1 Admission to the Under Graduate (UG) program shall be made either on the basis of the merit rank obtained by the candidate in the entrance test conducted by the Telangana State Government (TS EAMCET) and on the basis of any other order of merit approved by the Government from time to time, including admissions under Management/NRI Category.

2.2 The Government orders with regard to the admissions in vogue shall prevail.

2.3 The candidate should have passed the prescribed qualifying examination before the date of Admission.

2.4 The medium of instruction is **English**.

3 B.Tech PROGRAMME STRUCTURE

3.1 A student after securing admission shall complete the B.Tech programme in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of First year First semester, failing which the student shall forfeit seat in B.Tech Programme. Each student shall secure 160 credits (with CGPA ≥ 5), required for the completion of the Under Graduate Programme and the award of the B.Tech. Degree.

3.2 UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms are listed below.

3.2.1 Semester Scheme

All Under Graduate Programme is of 4 academic years (8 semesters). Every academic year shall be divided into two regular semesters known as the first semester and the second semester. Every Semester has - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS)as indicated by UGC, and the Curriculum/ Course structure as suggested by AICTE are followed.

3.2.2 Credit Courses

All Subjects/Courses are to be registered by the student in a semester to earn credits which shall be assigned to each Subject/Course in a L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

- One credit for one hour/ week/ semester for one Theory/ Lecture (L) courses or Tutorials (T) and,
- One credit for two hours/ week/ semester for laboratory/ practical (P) Courses.

Courses like Gender Sensitization, Environmental Science, Induction Program are mandatory courses. These courses will not carry any credits.

3.2.3 Subject/ Course Classification

The College has followed almost all the guidelines issued by AICTE/ UGC. All Subjects/Courses offered for the UG Programmes in Engineering (B.Tech.) are broadly

classified as follows.

The groups of the subjects shall be as given in the table here under as suggested by AICTE.

S. No.	Subject Categories
1	Humanities and Social Sciences (HS) Subjects: English, Management and the Courses dealing with Personality Development
2	Basic Sciences (BS) Subjects including Mathematics, Physics and Chemistry
3	Engineering Sciences (ES): Engg. Workshop, Drawing, Fundamentals of Computer Science and Courses dealing with the basics of Electrical/Electronics/Mechanical Engineering
4	Professional Core (PC) Subjects: Includes core courses related to the parent discipline / department / branch of Engineering
5	Professional Elective (PE) Subjects: Includes elective courses related to the parent discipline / department / branch of engineering. Students has an option to select amongst the offered courses
6	Open Elective (OE) Subjects: Elective courses which include inter – disciplinary courses or courses in an area outside the parent discipline /
7	Project Work, Seminar and/or Internship in Industry or elsewhere along with Mini project.
8	Mandatory Courses (MC): Mandatory non-credit courses
9	**Minor/ Honors Courses** **Honors**: To facilitate the students to choose additional courses by deep dive into emerging areas in their own discipline. The Honors program shallbe offered by the parent department. **Minor**: Students, who are desirous of pursuing their special interest areas other than their branch of engineering, may opt for additional courses in

B. Tech Year Wise distribution of credits

S.No.	Year	Semester	Regular Curriculum	
			Credits	Total Credits
1	1st Year	I	20	**40**
		II	20	
2	2nd Year	I	20	**40**
		II	20	
3	3rd Year	I	20	**40**
		II	20	
4	4th Year	I	20	**40**
		II	20	
Total No. of Credits				**160**

4 COURSE REGISTRATION/DROPPING

4.1 Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the academic calendar. It is absolutely necessary for the student to register for Courses in time.

4.2 A student would be allowed to register for an Additional Course only if the student satisfies the prerequisites.

4.3 Departments will notify at the time of registration about the minimum number of students to be enrolled for a particular Open Elective to be offered.

4.4 Any student may be barred from registering for any course on disciplinary grounds.

4.5 **Open Electives:** The students have to choose three Open Electives (OE-I, II& III) from the list of open electives given. However, the student cannot opt for an Open Elective Subject offered by his own (parent) department.

4.6 Professional Electives:

Students have to register from the list of professional elective courses as prescribed in the

course structure of the programme.

5 ELECTIVE COURSES TO BE OFFERED

5.1 An Elective Course may be offered to the students, only if a minimum of 30 students opt for it.

5.2 More than one faculty member may offer the same subject (lab/ practical may be included with the corresponding theory subject in the same semester) in any semester.

6 ATTENDANCE REQUIREMENTS

6.1 A student shall maintain a minimum required attendance of 75% in AGGREGATE. He/She is eligible to write the Semester End Examinations only if the student acquires a minimum of 75% of attendance in class work aggregate of all the Subjects/Courses in that Semester.

6.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic council on genuine medical grounds, based on the student's representation with supporting evidence. Student shall submit the same as and when such requirement arises but not at the end of semester.

6.3 A stipulated fee shall be payable towards condonation of attendance shortage.

6.4 Shortage of attendance below 65% in aggregate shall in no case be condoned.

6.5 Students, whose shortage of attendance is not condoned, are not eligible to appear for Semester End Examinations of that semester. Such students are detained and their registration for the examination stands cancelled.

6.6 A student detained due to shortage of attendance in a semester may seek re-admission into that semester, as and when offered, within four weeks from the date of the commencement of class work. Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student. In case if there are any professional electives and/or open electives, the same may also be re-registered if offered. However, if those electives are not offered in the later semesters, then alternate electives may be chosen from the same set of elective courses offered under that category.

7 ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.6

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if a student secures not less than 35% (14 marks out of 40 marks in the **Continuous Internal Evaluation**, not less than 35% (21 marks out of 60 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing 'C' grade or above in that subject/ course.

7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if the student secures not less than 40% of marks in each of them.

The student is deemed to have failed, if he (i) does not submit a report on Industry Oriented Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such 'one reappearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 Promotion rules

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to First year second semester	Regular course of study of First yearfirst semester and shall satisfy attendance requirements.

2	First year second semester to Second year first semester	**(i)** Regular course of study of First year second semester and shall satisfy attendance requirements. **(ii)** Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to First year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Second year first semester to Second year second semester	Regular course of study of Second year first semester and shall satisfy attendance requirements.
4	Second year second semester to Third year first semester	**(i)** Regular course of study of Second year second semester and shall satisfy attendance requirements. **(ii)** Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to Second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to Third year second semester	Regular course of study of Third year first semester and shall satisfy attendance requirements.
6	Third year second semester to Fourth year first semester	**(i)** Regular course of study of Third year second semester shall satisfy attendance requirements. **(ii)** Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to Third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to Fourth year second semester	Regular course of study of Fourth year first semester and shall satisfy attendance requirements.

7.4 A Student (i) shall register for all Courses/Subjects covering 160Credits as specified and listed in the course structure, (ii) fulfils all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA ≥5.0 (in each semester), and

CGPA (at the end of each successive semester) ≥5.0, (iv) **passes all the mandatory courses**, to successfully complete the under graduate programme. The performance of the student in these 160 credits shall be taken into account for the calculation of 'the final CGPA (**at the end of under graduate programme**), and shall be indicated in the grade card / marks memo of IV-year II-semester.

7.5 If a student register for '**extra subjects**' (in the parent department or other department / branches of Engineering) other than those listed subjects totaling to 160 credits as specified in the course structure of his/her department, the performances in those '**extra subjects**' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be considered while calculating the SGPA and CGPA. For such '**extra subjects**' registered, percentage of marks and letter grade alone will be indicated inthe grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items 6 and 7.1 – 7.4 above.

7.6 A student eligible to appear in the Semester End Examination for any subject/ course, but absent for it or failed (thereby failing to secure 'C' grade or above) may reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject/ course will be carried over, and added to the marks obtained in the SEE supplementary examination for evaluating performance in that subject.

7.7 A student detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements. The academic regulations under which a student has been readmitted shall be applicable. However, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

7.8 A student detained due to lack of Credits in any year, may be readmitted after fulfillment of the Academic Requirements, with the Academic Regulations of the Batch into which he gets readmitted. If there are any Professional Electives/Open Electives, the same may also be re-registered if offered. However, if those Electives are not offered in later Semesters, then alternate Electives may be chosen from the same set of Elective Subjects offered

under that category.

7.9 A student detained due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of academic credits. The academic regulations under which the student has been readmitted shall be applicable to him.

7.10 Student, who fails to earn 160 credits as indicated in the course structure within eight academic years from the year of his/her admission, shall forfeit the seat in B. Tech. course and admission stands cancelled.

7.11 A student with a final CGPA (at the end of the UGP) < 5.00 will not be eligible for the Award of the Degree.

8 EVALUATION- DISTRIBUTION AND WEIGHTAGE OF MARKS

8.1 The performance of a student in every subject/course (including Practicals and Project Stage – I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination).

8.2 In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of two parts i) Part – A for 10 marks, ii) Part – B for 20 marks with a total duration of 2 hours as follows:

1. Mid Term Examination for 30 marks:

    a. Part - A : Objective/quiz paper for 10 marks.

    b. Part – B : Descriptive paper for 20 marks.

The objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks. The descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

The remaining 10 marks of Continuous Internal Assessment (out of 40) are distributed as:

1 Assignment for 5 marks. (Average of 2 Assignments each for 5 marks).

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

2 Subject Viva-Voce/Poster Presentation/Participatory Learning/Group Activities/Case Study on a topic in the concerned subject for 5 marks before II Mid-term Examination.

The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE 35% of marks (i.e. 21 marks out of 60) in SEE and however overall 40% of marks (i.e.40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

The details of End semester question paper pattern is as follows :

8.2.1 The Semester End Examinations (SEE), for theory subjects, will be conducted for 60 marks consisting of two parts viz. i) Part- A for 10 marks, ii) Part - B for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks
- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.
- The duration of Semester End Examination is 3 hours.

8.2.2 For the subject, Computer Aided Engineering Graphics, the Continuous Internal Evaluation (CIE) and Semester End Examinations (SEE) evaluation pattern is same as for other theory subjects.

8.3 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks
2. 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. The remaining 10 marks are for laboratory project which consists of the Design (or) Software/Hardware model Presentation (or) App Development or Prototype Presentation submission which shall be evaluated after completion of laboratory course before the semester end Practical examinations.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from other colleges which will be decided by the examination branch of the College.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up
2. 15 for experiment/program
3. 15 for evaluation of results
4. 10 marks for presentation on another experiment/program in the same laboratory course and
5. 10 marks for viva-voce on concerned laboratory course

- The student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.
- The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 mark out of 40 marks) in Continuous Internal Examination (CIE).

- In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

8.4 The evaluation of courses having ONLY internal marks in I Year I Semester and II Year II Semester is as follows:

I Year I Semester course (ex., Elements of CE/ME/EEE/ECE/CSE): The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

For CSE/IT and allied branches the Continuous Internal Evaluation (CIE) will be for 50 marks. Each Mid-Term examination consists of two parts i) Part – A for 20 marks, ii) Part – B for 20 marks with a total duration of 2 hours.

Part A: Objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks. **Part B:** Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

The remaining 10 marks of Continuous Internal Evaluation are for Assignment (5 marks) and Subject Viva-Voce/PPT/Poster Presentation/ Case Study (5 marks) and the evaluation pattern will remain same as for other theory subjects.

For all other branches, the Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

a) A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks

b) 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.

c) Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 15 marks.

d) The remaining 15 marks are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

II Year II Semester Real-Time (or) Field-based Research Project course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation.

The student is deemed to have failed, if he (i) does not submit a report on the Project, or does not make a presentation of the same before the internal committee as per schedule, or(ii) secures less than 40% marks in this course

8.5 In case, a few students are absent due to health reasons or any other unavoidable circumstances, or if a student wish to improve his/her performance in the internal marks a third mid-term examination will be conducted on payment of fees fixed by the examination branch. The test will be conducted in all the units of the subject.

8.6 There shall be an Industry training / Internship / Skill Development Courses / Paper presentation in reputed journal / Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship at reputed organization / Skill development courses / Paper presentation in reputed journal / Industry Oriented Mini Project shall be submitted in a report form and presented before the committee in III-Year II semester before End Semester Examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Internal Supervisor and a Senior Faculty Member of the Department. There shall be NO internal marks for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal (or) Industry Oriented Mini Project

8.7 Design and Drawing

For the subject having design and/ or drawing, (such as Engineering Graphics, Engineering Drawing, and Machine Drawing), the distribution shall be 40 marks for Internal Evaluation (20 marks for day-to-day work and 20 marks for internal tests) and 60 marks for Semester End Examination. There shall be two internal tests in a semester and average of two examinations shall be considered for the award of marks for internal examination.

8.8 The UG project shall be initiated at the end of the IV Year I Semester and the duration of

the project work is one semester. The student must present Project Stage – I during IV Year I Semester before II Mid examinations, in consultation with his Supervisor, the title, objective and plan of action of his Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approvalof the departmental committee, the student can start his project work.

8.9 UG project work shall be carried out in two stages: Project Stage – I for approval of project before Mid-II examinations in IV Year I Semester and Project Stage – II during IV Year II Semester. Student has to submit project work report at the end of IV Year II Semester. The project shall be evaluated for 100 marks before commencement of SEE Theory examinations.

8.10 For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule. A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.11 For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20 marks and Project Supervisor shall evaluate for 20 marks. The topics for Industry Oriented Mini Project/ Internship/SDC etc. and the main Project shall be different from the topic already taken. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

For conducting viva-voce of project, Principal/Director of the college selects an external examiner from the list of experts in the relevant branch submitted by the Head of the Department.

A student, who has failed, may reappear once for the above evaluation, when it is scheduled again; if student fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled

8.12 Seminar Presentation

There shall be a seminar presentation in IV-year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the departmental committee consisting of Head of the Department, Seminar Supervisor and a Senior Faculty member. The seminar report shall be evaluated for 100 marks. There shall be no SEE or external examination for the seminar.

If the student fails to present the Seminar as required in the IV-year II Semester He may reappear for the seminar when they are scheduled again (within one month); if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent Semester, as and when it is scheduled.

8.13 A student shall be given one time chance to re-register for a maximum of two subjects: ina semester

- If the internal marks secured by a student in the **continuous internal evaluation marks for 40** (Sum of average of two mid-term examinations consisting of objective & descriptive parts, average of 2 assignments and subject viva voce/PPT/Poster presentation/Case study on a topic in the concerned subject) are less than 35% and failed in those subjects

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the class work in next academic year.

In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

Subject	Internal Valuation Marks	External Valuation Marks	Total Marks
Theory/Engineering Drawing	40	60	100
Mini Project	0	100	100
Seminar	100	0	100
Major Project	40	60	100

8.14 Candidates shall be permitted to apply for recounting/revaluation of SEE scripts within 2 weeks from the date of release of results, with a payment of prescribed fee.

8.15 No marks or letter grades shall be allotted for Mandatory/Non-Credit Courses. Only Pass/Fail shall be indicated in Grade Card.

9 B.Tech with Minor Program

The Institution has introduced the **Bachelor of Technology in a particular specialization with minor program** *(For eg., B. Tech. in Electronics & Communication Engineering with Minor in AI&ML)*from AY. 2021-22.

The Bachelor of Technology (B.Tech.) with minor programs offered by VJIT focuses on the fundamental principle of Engineering, where the development of critical & analytical thinking and the ability to develop a distinctive approach to any given problem statement shall be the driving factor that fuels the pedagogic discourse.

A student will be eligible to get B. Tech. with Minor Degree, if he/she completes an additional 18 credits. These should be acquired through registered courses as per the respective courses offered by the Institute or through MOOCs courses as mentioned Annexure-I, as equivalent to the courses offered by the Institute.

1.1.3 Details are given in the Annexure –I

10 B.Tech (Honors)

The B. Tech. (Honors) programs are proposed to choose for an area of specialization among various emerging technologies in order to be a domain expert. A student will be eligible to get B. Tech. (Honors) Degree, if he/she completes an additional 20 credits. These should be acquired through registered courses as per the respective courses offered by the institution or through SWAYAM MOOCs as equivalent to the courses offered by the Institute.

1.1.4 Details are given in the Annexure -II

11 GRADING PROCEDURE

11.1 Grades will be awarded to indicate the performance of students in each theory subject, laboratory/ practical's/Seminar/ Industry Oriented Mini Project/Internship and Project Stage –I &II. Based on the percentage of marks obtained (Continuous Internal Evaluation and Semester End Examination, both taken together) as specified item7 and 8 of above, a corresponding letter grade shall be given.

11.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed.

Letter Grade	Performance	Grade Points	% of marks Secured (Class Intervals)
O	Outstanding	10	Greater than or equal to 90%
A+	Excellent	9	80% and less than 90%
A	Very Good	8	70% and less than 80%
B+	Good	7	60% and less than 70%
B	Average	6	50% and less than 60%
C	Pass	5	40% and less than 50%
F	Fail	0	Below 40%
AB	Absent	0	Absent

11.3 A Student who has obtained an **'F'** grade in any subject shall be considered 'failed' and is required to reappear as a 'supplementary student' in the semester End Examination as and when conducted. In such cases, Internal Marks in those subjects will remain the same as those obtained earlier.

11.4 To a student who has not appeared for a semester end examination in any subject, **'Ab'** grade will be allocated in that subject, and he is deemed to have **'failed'**. A Student will berequired to reappear as a 'Supplementary Student' in the Semester End Examination, as and when conducted. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

11.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

11.6 In general, a student shall not be permitted to repeat any subject/course(s) only for the sake of 'Grade Improvement' or 'SGPA/CGPA Improvement'. However, he has to repeat all the Subject/Courses pertaining to that Semester when he is detained due to shortage of attendance.

11.7 A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/course.

Credit points (CP) = grade point (GP) x credits …. For a subject/course

The Grade Point Average (GPA) will be calculated according to the formula:

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where C_i= Number of credits allotted to the i^{th} Subject and G_i= Grade points allotted for all courses passed in that semester

11.8 The student passes the Subject/ Course only when he gets GP $\geq$ 5 (P Grade or above).

11.9 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points ($\sum$CP) secured from all subjects/ courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

$$SGPA = \frac{\sum \text{Course Credits } (C_i) \times \text{Grade Points } (G_i)}{\sum \text{Course Credits } (C_i)}$$

WhereC_i = Number of credits allotted to the i^{th} Course

G_i = Grade points allotted to i^{th} Course passed in that semester

$\sum C_i$ = Total number of credits for all courses registered in that semester

And 'i' is the course indicator index (takes into account all courses in a semester).

11.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in all registered courses in all semesters, and the total number of credits registered in all the semesters. CGPA is rounded off to two decimal places. CGPA is thus computed from the I year II semester onwards at the end of

each semester as per the formula

$$CGPA = \frac{\sum \text{Course Credits } (C_j) \times \text{Grade Points } (G_j)}{\sum \text{Course Credits } (C_j)}$$

Where

C_j= Number of credits allotted to the j^{th} Course

G_j= Grade points allotted to j^{th} Course passed up to that semester

$\sum C_j$ = Total number of credits for all courses registered until that semester

And 'j' is the subject indicator index (takes into account all subjects until the semester)

After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course	Credits	Letter Grade	Grade Points	Credit Points
Course 1	**4**	**A**	**8**	**4x8=32**
Course 2	**4**	**O**	**10**	**4 x 10=40**
Course 3	**4**	**C**	**5**	**4x5=20**
Course 4	**3**	**B**	**6**	**3x6=18**
Course 5	**3**	**A+**	**9**	**3x9=27**
Course 6	**3**	**C**	**5**	**3x5=15**
	21			**152**

SGPA = 152/21 = 7.24

11.11 llustrative Example:

An illustrative example given in below Table indicates the use of the above two equations in calculating SGPA and CGPA, both of which facilitate the declaration of academic performance ofa student, at the end of a semester and at the end of successive semesters respectively. Both of them shall be normally calculated up to the second decimal position, so that the *CGPA*, in particular, can be made use of in awarding a rank for the student's performance in a class or college. If two students get the same *CGPA*, the tie should be resolved by considering the number of times a student has obtained higher *SGPA;* But, if it is not resolved even at this stage, the number of times a student has obtained higher grades like O, A, B etc shall be taken into accountin rank ordering of the students in a class.

Example:

Year and Semester	Course No.	Credits	Grade	Grade Points	Credit Points
I Year I Semester	XX101	5	A	8	40
I Year I Semester	XX102	4	F	0	00
I Year I Semester	XX103	3	A+	9	27
I Year I Semester	XX104	4	F	0	00
I Year I Semester	XX105	5	C	5	25
I Year I Semester	XX106	5	A	8	40
Total		26(18*)			132
SGPA = 132/26=5.08 CGPA =5.08					
I Year II Semester	XX107	5	B+	7	35
I Year II Semester	XX108	4	A	8	32
I Year II Semester	XX109	3	C	5	15
I Year II Semester	XX110	5	B	6	30
I Year II Semester	XX111	4	A+	9	36
I Year II Semester	XX112	2	F	0	00
I Year II Semester	Xx113	2	A	8	16
I Year II Semester					
Total		25(23*)			164
SGPA = 164/25=6.56 CGPA = 296/51 =5.80					

*Total No. of credits excluding those with 'F'; this is particularly important to keep track of the number of credits earned by a student up to any semester.

The above illustrated calculation process of CGPA will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. Programme.

11.12 For merit ranking or comparison purposes or any other listing, only the 'rounded off' values of the CGPA will be used.

11.13 For calculations listed in regulations 11.7 to 11.10, performance in failed subjects/ courses (securing F grade) will also be taken into account, and the credits of such subjects/courses will also be included in the multiplications and summations. After passing the failed subject(s) newly secured letter grades will be taken into account for calculation of SGPA and CGPA. However, mandatory courses will not be taken into consideration.

SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise, the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester.

12 EARNING OF CREDITS

A student shall be considered to have completed a Course successfully and earned the credits if he/she secures an acceptable letter grade in the range 'O' to 'P'. Letter grade 'F'in any Course implies failure of the student in that Course and no credits earned.

13 PASSING STANDARDS

13.1 A student shall be declared successful or 'passed' in a semester, if he secures a GP ≥ 5 ('C' grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA ≥ 5.0 at the end of that particular semester); and he shall be declared successful or 'passed' in the entire undergraduate programme, only when gets a CGPA ≥ 5.00 ('C' grade or above) for the award of the degree as required.

13.2 After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.) and credits earned. There is NO exemption of credits in any case.

13.3 A Student shall be declared successful or 'passed' in any Non-Credit Subject/ Course, if he secures a minimum of P grade.

13.4 After the completion of each Semester, a Grade Card or Grade Sheet (or Transcript) shall

be issued to all the registered students of that semester, indicating the Letter Grades and Credits earned. It will show the details of the courses registered (Course Code, Title, No. of Credits, Grade Earned etc.), Credits earned, SGPA, and CGPA.

14 DECLARATION OF RESULTS

14.1 Computation of SGPA and CGPA are done using the procedure listed in 11.7 TO 11.10.

14.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

% of Marks = (final CGPA – 0.5) x 10

15 AWARD OFDEGREE

15.1 A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have 'qualified' for the award of B.Tech. degree in the branch of Engineering selected at the time of admission.

15.2 A student who qualifies for the award of the degree as listed in item 15.1 shall be placed in the following classes

15.3 A student with final CGPA (at the end of the undergraduate programme) > 8.00, and fulfilling the following conditions - shall be placed in 'First Class with Distinction'. However, he/she

(i) Should have passed all the subjects/courses in 'First Appearance' within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA > 8 shall be placed in 'First Class'.

15.4 Students with final CGPA (at the end of the undergraduate programme) ≥ 7.0 but < 8.00 shall be placed in 'First Class'.

15.5 Students with final CGPA (at the end of the undergraduate programme) ≥ 6.00 but < 7.00, shall be placed in 'Second Class'.

15.6 All other students who qualify for the award of the degree (as per item 15.1), with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 6, shall be placed in 'pass class'.

15.7 A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

16 CONSOLIDATED GRADE CARD

A consolidated grade card containing credits & grades obtained by the candidates will be issued after completion of the four years B. Tech Program.

17 WITHHOLDING OF RESULTS

If the student has not paid the fees to the College at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases and the matter will be referred to College Academic Committee for final decision.

18 TRANSITORY REGULATIONS

18.1 Discontinued, detained for attendance, detained for want of credits, or failed students are eligible for readmission as and when the course is offered during the subsequent academic year as per the college admission procedures.

18.2 Students on transfer from a non- autonomous or from an autonomous college shall complete all the courses of the concerned programme not covered in the earlier organization. However, he/she should take the remaining courses in the programme along with the other students.

18.3 There shall be no branch transfers after the cut-off date of admissions made in the B.Tech. I year.

19 TRANSCRIPTS

After successful completion of the total programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee.

20 SUPPLEMENTARY EXAMINATIONS

In addition to the Regular end semester examinations, Supplementary Examinations for the previous semesters will be conducted along with End Semester Examinations**.** A student can appear for any number of supplementary examinations till he/she clears all courses which he/she could not clear in the first attempt. However, the maximum stipulated period cannot be relaxed under any circumstances.

21 GRADUATIONCEREMONY

21.1 The College shall have its own annual Graduation Ceremony for the award of degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.

21.2 The College shall institute Prizes and Awards to meritorious students, for being given away annually at the Graduation Ceremony.

22 **TERMINATION** OF THE PROGRAM

The admission of a student to the program may be terminated and the student may be asked to leave the Institute in the following circumstances:

- If the student fails to satisfy the Academic requirements of the program within the maximum period stipulated for that program.
- If the student fails to satisfy the norms of discipline specified by the institute from time to time.

23 NON-CREDIT COURSES (Mandatory Courses)

23.1 Requirement of 75% attendance as per the college regulations is compulsory of completing the Mandatory courses.

23.2 Specified number of Mandatory Courses among the designated ones is compulsory requirement for all the students for the award of B.Tech. Degree.

23.3 Although these courses do not carry any credits, performance in these subjects is evaluated following the procedure adopted for other subjects with the same marks. However, their performance will be indicated in the student's memo of marks as Satisfactory/ Unsatisfactory.

1.1.5 MALPRACTICES RULES

DISCIPLINARY ACTION FOR/IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	**Punishment**
	If the student:	
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 student is appearing but has not made use of (material shall include any marks on the body of the student 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.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student 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 students 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 orany other form of material relevant to the subject of the examination (theory or practical) in which the student is Appearing.	Expulsion from the examination hall and cancellation of the performance in that subject only.
3.	Impersonates any other student in Connection with the examination.	The student who has impersonated shall be Expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of

		the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that Semester/ year. The student is also debarred for two consecutive semesters from class work and All Examinations. The continuation of the course by the student 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 student 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 student is also debarred for two consecutive semesters from class work and All Examinations. The continuation of the course by the student 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 writesto 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 orb 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 actwhich in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the	1. 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 student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/ year. 2. The students 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.

	tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part there of inside or outside the examination hall.	1. Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student 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. 2. The student is also debarred for two consecutive semesters from class work and All University examinations. The continuation of the course by the student is subject to the academic regulations in connection with Forfeiture of seat.
8.	Possesses any lethal weapon or firearm in the examination hall.	1. Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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. 2. The student is also debarred and forfeits the seat. Police case will be registered.
9.	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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 student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and, a police case Will be registeredagainst 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 student has already appeared for 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 student has appeared for 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 Principal for further action to award a suitable Punishment.	

Malpractices identified by squad or special invigilators: Punishment to the students as per the above guidelines.

24 General

24.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”,“her”, “hers”.

24.2 Where the words “Subject” or “Subjects”, occur in these regulations, they also imply “Course” or “Courses”.

24.3 The academic regulation should be read as a whole for the purpose of interpretation.

24.4 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

24.5 The Institution may change or amend the Academic Regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the date notified by the Institution.

1.1.6 ACADEMIC REGULATIONS FOR B. TECH LATERAL ENTRY STUDENTS

Applicable for the students admitted into II-year B. Tech. (Lateral Entry Scheme) from the Academic Year 2023-24.

1. Eligibility for award of B. Tech. Degree (LES)

The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.

The candidate shall register for 120 credits and secure 120 credits by securing a minimum CGPA of ≥ 5 of B.Tech. II to IV year for the award of B.Tech. Degree.

The student(s), who fail to fulfill the requirement for the award of the degree in six Academic years from the year of admission, shall forfeit their seat(s). The attendance regulationsof B. Tech. (Regular) shall be applicable to B.Tech. (LES).

2. Promotion Rule

A student shall be promoted from B.Tech., II Year to III Year if he/she gets at least a minimum of 24out of 40 credits, up to II-year II semester, from all the examinations, whether or not the candidate takes the examinations.

A student shall be promoted from III year to IV year if he/she gets a minimum of 48 out of 80 credits, up to III-year II semester, from all the examinations, whether or not the candidate takes the examinations.

A student shall register and put-up minimum attendance in all 120 credits and earns all 120 credits tobe eligible for the award of B. Tec degree.

A student, who fails to earn 120 credits as indicated in the course structure within six academic years, shall forfeit his/her admission in B.Tech. Course.

3. Award of Class

A student, who satisfies all the requirements prescribed for the completion of the B.Tech. program, is eligible for the award of the said degree, in any one of the following four classes:

CGPA	Class Awarded	
≥8.00	First Class with Distinction	From the CGPA secured from 120 credits
≥7.00 - <8.00	First Class	
≥6.00 - <7.00	Second Class	
≥5.00 - <6.00	Pass Class	

4. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B.Tech. (Lateral Entry Scheme).

Annexure-I

1.1.7 B. Tech with Minor Program

VJIT has always been emphasizing to orient the students towards the technologies that shall drive the world in the years to come; the Institution has introduced the Bachelor **of Technology in a particular specialization with minor program** *(For eg., B. Tech. in Electronics & Communication Engineering with Minor in AI&ML)* from AY. 2021-22.

The Bachelor of Technology (B.Tech) with minor programs offered by VJIT focuses on the fundamental principle of Engineering, where the development of critical & analytical thinking and the ability to develop a distinctive approach to any given problem statement shall be the driving factor that fuels the pedagogic discourse.

1.1.8 B. Tech. with Minor degree:

A student will be eligible to get B. Tech. with Minor Degree, if he/she completes an additional 18 credits. These should be acquired through registered courses as per the respective courses offered by the Institute or through MOOCs as equivalent to the courses offered by the Institute.

1.1.9 The key features of the B.Tech with Minor program being:

- The student can identify **only one area** of specialization along with his/her basic engineering degree.
- The no. of courses for Minor program is limited to 2 in a semester along with normal courses.
- In addition to the traditional B.Tech. program which is a 4-Year (8 Semester program) offering 160 course credits, additional **18 Credits**(minimum) to be completed as part of the **B.Tech with Minor program** between the **5th** and **8th** semester within the same period of 4-Year B. Tech. program.
- To successfully complete the **B.Tech with Minor program** the student shall need to clear the examinations for the additional 18 Credits. These credits can be acquired adopting advanced subjects in the offered specialization/ interdisciplinary studies, etc.

The following are the recommended areas for Minor programs:

S. No.	Minor Program	Eligible branch of students	@ Offering Department	Award of Degree
1	Construction Engineering & Management	All branches, except B. Tech. Civil Engg.	Civil Engg.	"B. Tech. in branch name with Minor in Construction Engineering & Management
2	Robotics	All branches, except B. Tech. Mech. Engg	Mech. Engg.	"B. Tech. in branch name with Minor in Robotics
3	Electric Vehicles	All branches, except B. Tech. EEE	EEE	"B. Tech. in branch name with Minor in Electric Vehicles
4	Sustainable Energy	All branches, except B. Tech. EEE	EEE	"B. Tech. in branch name with Minor in Sustainable Energy
5	IoT	All branches, except B. Tech. ECE	ECE	"B. Tech. in branch name with Minor in IOT"
6	CSE	All branches, except B. Tech. CSE	CSE	"B. Tech. in branch name with Minor in CSE
7	IT	All branches, except B. Tech. IT	IT	"B. Tech. in branch name with Minor in IT
8	AI&ML	All branches, except B. Tech. AI	AI	"B. Tech. in branch name with Minor in AI&ML
9	Business & Innovation Management (B&IM)	All branches of B.Tech.	MBA	"B. Tech. in branch name with Minor in B&IM

1.1.10 Rules & Regulations for B. Tech. with Minor Degree

1. The duration and all the academic regulations are on par with regular 4-Years B. Tech. program. A student completes/earns all the required credits of a course, if he/ she registers for the course and obtains a passing grade.
2. Only Students having earned all the credits at the end of the third semester (i.e., end of 2nd Year I-semester) without active backlogs are eligible to register for Minor program, in the fifth semester only.
3. For B. Tech with Minor, a student needs to earn additional minimum 18 credits (over and above the required 160 credits for B. Tech degree) as per the Minor program course structure.
4. Course registration fee per course should be met by the students only. The registration fee per credit is Rs.1000/-.
5. After registering for the Minor programme, if a student fails in any registered course and unable to earn all the required 18 credits in a specified duration (twice the duration of the course), he/she shall not be awarded Minor degree. However, if the student earns all the required credits of 160 for B. Tech., he/she will be awarded only B. Tech degree in the

concerned discipline. There is no transfer of credits from Minor program courses to regular B. Tech. degree course& vice versa.

6. These 18 credits (minimum) are to be earned from:
   - Additional Courses offered in the specialization by the concerned department.
   - MOOC courses offered by SWAYAM MOOCs as notified/approved by the university (minimum 3 credits each) from time to time.
   - Any expenses incurred for the MOOCs course to be met by the students only.
7. Online courses registered shall be certified ones with grading/marks/pass. Only Pass-grade/ pass-marks/ pass or above grade/marks shall be considered for inclusion ofgrades.
8. If the MOOC course is a pass course without any grades, the grade to be assigned as per the main regulations.
9. Prior to registration to MOOC courses, formal approval of the courses, by the University based on the organization of the programme, syllabus coverage, detailed duration of the programme, nature of evaluation etc. is needed.
10. The additional courses (for minimum of 18 credits) may be from the departments offering courses/subjects for the Minor degree. These subjects can be considered as advanced courses in that specialization/interdisciplinary courses etc.
11. However, the choice to opt/ take the Minor program is purely on the choice of the students in a particular engineering stream. Only top 50% of the total class in each specialization, based on their overall percentage of marks without active backlogs up to 3rdsemester (II-year I Semester), are eligible to register for Minor program courses/ subjects.

1.1.11 Requirement for the Award of B.Tech with Minor Degree:

a) A student may opt for B.Tech with Minor degree if she/he has no active backlogs till 3rdsemester.
b) For B. Tech with Minor, a student needs to earn additional 18 credits (minimum over and above the required 160 credits for B. Tech degree) as per his/her registered Minor program.
c) Student should take permission of registration for the B.Tech with Minor program from Head of the department & faculty/course in-charge before commencement of 3rdYear I Semester or 5th Semester.
d) To successfully complete the B.Tech with Minor program the student shall need to clear the examinations for the additional 18 Credits. The examinations shall be conducted as per the AICTE as well as University guidelines.
e) The student shall be given a choice of withdrawing all the courses registered and/or credits earned for Minor courses/degree; and in that case the student will be awarded only B. Tech. degree in the concerned specialization on earning the required credits of 160 in a specified duration.

The following are the course structure of B.Tech Minor programs offered by various departments:

1.1.12 Course Structure of B.Tech Minor Programs offered by Various Departments

Department of Civil Engineering

1.1.13 B.TECH MINOR IN CONSTRUCTION ENGINEERING & MANAGEMENT

S. No.	Year/ Semester	Course	L	T	P	Credits
1	III-I	Principles of Surveying/ **MOOCS**	3	0	0	3
2	III-I	Surveying Lab	0	0	3	1.5
3	III-II	Essentials of building planning / **MOOCS**	3	0	0	3
4	III-II	Computer aided Building planning Lab	0	0	3	1.5
5	IV-I	AI applications in construction practices	3	0	0	3
6	IV-I	Construction Management/ **MOOCS**	3	0	0	3
7	IV-II	Mini Project	0	0	6	3
Total Credits						**18**

Department of Mechanical Engineering

B.TECH MINOR IN ROBOTICS

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1	III-I	Principles of Robotics	3	0	0	3
2		SCI Lab for Robotics Lab	0	0	3	1.5
3	III-II	Microcontrollers for Robotics	3	0	0	3
4	IV-I	Advanced Robotics (or) SWAYAM course on Introduction to Robotics	4	0	0	4
5		Robotic Simulation Lab	0	0	3	1.5
6	IV-II	Implementation of Robotic Systems	3	0	0	3
7		Mini Project	0	0	4	2
Total Credits						**18**

1.1.14 Department of Electrical & Electronics Engineering

B.TECH MINOR IN SUSTAINABLE ENERGY

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1.	III-I	Energy and its Resources	4	0	0	4
2.	III-II	Climate Change Understanding and Observations	3	0	0	3
3.	III-II	Energy and its Resources Lab	0	0	3	1.5
4.	IV-I	Energy Storage for Renewable	3	0	0	3
5.	IV-II	**Electives** 1. Electronics for Renewable 2. Solar Energy Technologies and System Design 3. Solar Energy System Installations and Maintenance	3	0	0	3
6.	IV-II	Energy Systems Lab	0	0	3	1.5
7.	IV-II	Internship/Mini Project	0	0	4	2
Total Credits						**18**

B.TECH MINOR IN ELECTRIC VEHICLES

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1.	III-I	Electric Vehicle and Energy Systems	4	0	0	4
2.	III-II	Power Electronics and Control of Electric Machines	3	0	0	3
3.	III-II	Simulation Lab	0	0	3	1.5
4.	IV-I	Automotive Transmission and Communication	3	0	0	3
5.	IV-II	**Electives** 1. Electric Vehicle Dynamics and Testing 2. Battery Charging Technology for EVs 3. Electric Vehicle: Safety and Regulations and Future of EVs	3	0	0	3
6.	IV-II	Electric Mobility Lab	0	0	3	1.5
7.	IV-II	Internship/Mini Project	0	0	4	2
Total Credits						**18**

1.1.15 Department of Electronics & Communication engineeringB.TECH MINOR IN INTERNET OF THINGS

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1	III-I	Embedded Sensors and IOT Architectures	4	0	0	4
2	III-I	Essentials of Python Programming Laboratory	0	0	3	1.5
3	III-II	IOT Communication Protocols	3	0	0	3
4	III-II	Smart Technologies	3	0	0	3
5	IV - I	Fog & Edge Computing for IoT	3	0	0	3
6	IV - I	IoT Automation withRaspberry-PI Laboratory	0	0	3	1.5
7	IV - II	Mini Project	0	0	4	2
Total Credits						**18**

Department of Computer Science and Engineering

B.TECH MINOR IN COMPUTER SCIENCE AND ENGINEERING

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1	III-I	Computer System Architecture	3	0	0	3
2	III-I	Data Structures	3	0	0	3
3	III-I	Data Structures Lab	0	0	3	1.5
4	III-II	Data Warehousing and Data Mining	3	0	0	3
5	III-II	Data Warehousing and Data Mining Lab	0	0	3	1.5
6	IV-I	Artificial Intelligence Linux Programming Software Testing Methodologies E-Commerce	3	0	0	3
7	IV-II	Mini Project	0	0	6	3
Total Credits						**18**

1.1.16Department of Information Technology

B.TECH MINOR IN INFORMATION TECHNOLOGY

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1	III-I	Fundamentals of Algorithms	3	0	0	3
2	III-I	Algorithms Lab	0	0	3	1.5
3	III-II	Foundations of Cloud Computing	3	0	0	3
4	IV-I	Fundamentals of Database Management Systems	3	0	0	3
5	IV-I	Fundamentals of Database Management Systems Lab	0	0	3	1.5
6	IV-II	Principles of Artificial Intelligence Big Data Analytics Internet of Things Blockchain Technologies (or) Swayam Course on Big Data Computing	3	0	0	3
7	IV-II	Mini Project				3
Total Credits						**18**

Department of Artificial Intelligence

B.TECH MINOR IN ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1	III-I	Foundations of Artificial Intelligence	3	0	0	3
2	III-I	Python Programming Lab	0	1	3	2.5
3	III-II	Foundations of Machine Learning	3	0	0	3
4	III-II	Foundations of Machine Learning Lab	0	0	3	1.5
5	IV-I	Basics of Deep Learning	2	0	0	2
6	IV-I	Basics of Deep Learning Lab	0	0	2	1
7	IV-II	**Electives:** 1. Principles of Natural Language Processing 2. Introduction to Computer Vision 3. Soft Computing 4. Introduction to Artificial Neural Networks	3	0	0	3
8	IV-II	Mini Project	0	0	0	2
Total Credits						**18**

1.2 Department of Management Studies

1.2.1 B.TECH MINOR IN BUSINESS & INNOVATION MANAGEMENT

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1	III - I	Foundations of Management	4	0	0	4
2	III - II	Innovation & Design Thinking	3	0	0	3
3	III - II	Design thinking and Ideation Laboratory	0	0	3	1.5
4	IV - I	Business Ideation Business Models	3	0	0	3
5	IV - I	Business Plan Development	0	0	3	1.5
6	IV - II	**Any ONE of the following subjects:** 1. Project management 2. Market Research 3. Legal Aspects of Business 4. Technology Management (if not studied in the regular course)	3	0	0	3
7	IV - II	**Mini Project** Field Study Report/ Feasibility reporton New ventures/ Pitfalls of entrepreneurship	0	0	4	2
Total Credits						**18**

Annexure-II

2 B.Tech (Honors)

The B. Tech. (Honors) programs are proposed to choose for an area of specialization among various emerging technologies in order to be a domain expert. A student will be eligible to get B. Tech. (Honors) Degree, if he/she completes an additional 20 credits. These should be acquired through registered courses as per the respective courses offered by the University or through SWAYAM MOOCs as equivalent to the courses offered by the Institute.

1. Objectives

The key objectives of offering **B. Tech. (Honors)** programs are:

- To expand the domain knowledge of the undergraduate students.
- To increase educational and professional skills required for pursuing higher studies or research in the area of interest.
- To acquire more knowledge as per industry requirement for better employment.

The key features of the **B.Tech. (Honors)** program being:

- The student can identify **only one area** of specialization along with his/her basic engineering degree.
- The no. of courses registered for honors is limited to TWO in a semester along with normal courses.
- In contrast to a traditional B. Tech. program which is a 4 Year (8 Semester program) offering 160 course credits, the **B. Tech. (Honors)** program is a 4 Year program (8 Semester program) offering 180 course credits.
- The additional **20 Credits (**Minimum, and maximum 20 credits**)** to be completed as part of the **B. Tech. (Honors)** program is to be spaced out between the **5th**and **8th semester.**
- To successfully complete the **B. Tech. (Honors)** program the student shall need to clear the examinations for the additional 20 Credits. These credits can be acquired opting advanced subjects in the offered specialization/ research/ interdisciplinary studies, etc.

2. Proposed Specialization Details

As per AICTE guide lines 2021-22, some of the VJIT proposed B. Tech. (Honors) programs are given below in each major discipline:

S. No.	Honors Program	Eligible branch of students	@ Offering Department	Award of Degree
1.	Structural Engineering	B. Tech. Civil Engg.	Civil Engg.	"B. Tech. (Honors) in branch name with Specialization in Structural Engineering
2.	CAD/ CAM	B. Tech. Mech. Engg.	Mech. Engg.	"B. Tech. (Honors) in branch name with Specialization in CAD/CAM
3.	Power Systems	B. Tech. EEE	EEE	"B. Tech. in branch name with Minor in Power Systems
4.	ECE	B. Tech. ECE	ECE	"B. Tech. (Honors) in branch name with Specialization in ECE
5.	CSE	B. Tech. CSE	CSE	"B. Tech. (Honors) in branch name with Specialization in CSE

3. Rules and Regulations for B. Tech. (Honors) Degree

1. The duration and all the academic regulations are on par with regular 4-Years B. Tech. program. A student will be awarded B. Tech. (Honors) degree, if he/she completes & earns all the required credits of a course for the registered courses and obtains a passing grade.
2. The department concerned shall have at least one M.Tech (Preferably NBA accredited) in the concerned stream, for B.Tech. (Honors) registration.
3. Only Students having earned all the credits with CGPA of **7or above** at the end of the third semester (i.e., end of 2nd Year I Sem.) are eligible to register for B.Tech. (Honors), in the fifth semester only.
4. For B. Tech. (Honors), a student needs to earn additional minimum 20 credits (over and above the required 160 credits for B. Tech degree) relevant to her/his discipline as per the course structure.
5. Course registration fees per course should be met by the students only. The registration fees per credit is Rs.1000/-.

6. After registering for the B.Tech. (Honors) programme, if a student fails in any registered course and unable to earn all the required 20 credits in a specified duration, he/she will not be eligible for obtaining B.Tech. (Honors) degree.
7. There is NO reduction in total no. of credits offered in the concerned regulations and NO credit transfer from normal courses to honors courses and vice versa.
8. These 20 credits are to be earned from:
   - Additional Courses offered in the same specialization by the concerned department. Course registration fee per course should be met by the students only as per the norms of the University.
   - Courses offered by NPTEL/ SWAYAM MOOCs as notified/approved by the university (minimum 3 credits each) from time to time. The duration of courses shall be a minimum of 12-14 weeks. The assessment and certification of the NPTEL/SWAYAM MOOCs courses shall be as per the prescribed norms of the NPTEL and approved by the Institute
   - Any expenses incurred for the NPTEL/SWAYAM MOOCs course should be met by the students only.
9. Online courses registered shall be certified ones with grading or marks or pass/ fail. Only Pass- grade/ pass-marks/ pass or above grade/marks shall be considered for inclusion of grades.
10. If the MOOC course is a pass course without any grades, the grade to be assigned as per the main regulations.
11. The additional courses (for minimum of 20 credits) may be from the same department as the undergraduate major. These subjects can be considered as advanced courses in that specialization/ research/ interdisciplinary courses etc.
12. However, the choice to opt/take the Honors program is purely on the choice of the students in a particular engineering stream. Only top 30% of the total class in each specialization, based on their overall percentage of marks in first attempt (without fail in any subject) up to 3rd semester (II-year I Semester), and are eligible to register for honorsprogram courses/ subjects.

2.1.1 Requirement for the Award of B. Tech. (Honors) Degree:

A student enrolled in a B. Tech. program may also graduate with Honors, provided the student completes all the additional requirements for Honors, as specified by the regulations for the program in which he/she is enrolled. These additional requirements normally should include:

a) For B. Tech (Honors), a student needs to earn additional 20 credits (minimum, over and above the required 160 credits for B. Tech degree) relevant to the discipline as recommended by the faculty advisor based on the courses offered in course structure for honors degree.
b) Student should not have received any ‘F’ grade throughout the program in first attempt (without fail in any subject).
c) Transfer of credits will not be permitted from regular courses to honors courses and vice versa.

2.1.2 4. Registration

1) At the beginning, just before the start of classes, of each semester, a student shall register for the courses he/ she wishes to take in that semester. A student shall normally be allowed to register for a course only if he/she has passed all the necessary pre-requisites for that course.
2) Student should take permission of registration for the B.Tech with Honors program from Head of the department & faculty/ course in-charge before commencement of 3rd Year I Semester or 5th Semester.
3) Registration is compulsory for all students, and is the sole responsibility of the student and must be completed before the last date of registration with necessary course registration fee per subject.
4) No student is allowed to register directly and the registration shall be through institute/ department. The registered students list shall be submitted to the university by the concerned principal.
5) The institute/ department shall maintain the record of student registered and pursing the Honors degree.
6) The institute/ department shall prepare the time table for the registered Honors courses without any overlap/ clash on other courses the student registered for.
7) Minimum class strength (i.e., 33% of intake) is required for offering in-class Honors course.

The following are the course structure of B.Tech Honors programs offered by various departments:

2.1.3 Course Structure of B.Tech Honors Programs offered by Various Departments

Department of Civil Engineering

2.1.4 B.TECH HONORS IN STRUCTURAL ENGINEERING

S. No	Year/ Semester	Course Title	L	T	P	Credits
1	III-I	Advanced R.C. Design	3	0	0	3
2	III-I	Advanced Concrete Lab	0	0	3	1.5
3	III-II	Structural Dynamics	3	0	0	3
4	III-II	Computer aided structural design Lab	0	0	3	1.5
5	IV-I	Research Methodology	3	0	0	3
6	IV-I	Technical Paper Writing	2	0	0	2
7	IV-II	Cost management of Engineering projects/ one course from MOOCS	3	0	0	3
8	IV-II	Earthquake Resistant Design Of Buildings / one course from MOOCS	3	0	0	3
Total Credits						**20**

Department of Mechanical Engineering

B.TECH HONORS IN CAD/ CAM

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1	III-I	Industrial Robotics	4	0	0	4
2	III-II	Additive Manufacturing (or) SWAYAM Course on Fundamentals of Additive Manufacturing Technologies	4	0	0	4
3		Robotic Simulation &3D Printing Lab	0	0	3	1.5
4	IV-I	Advanced Finite Element Method	3	0	0	3
5		Technical Paper Writing	0	0	4	2
6	IV-II	Advanced CAD	4	0	0	4
7		CAD/CAM/CAE Lab	0	0	3	1.5
Total Credits						**20**

2.1.5 Department of Electrical & Electronics Engineering

B.TECH HONORS IN POWER SYSTEMS

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1	III-I	Honors Elective - 1	3	0	0	3
2	III-II	Research Methodologies	3	0	0	3
3	III-II	Honors Elective - 2	3	0	0	3
4	IV-I	Honors Elective - 3	3	0	0	3
5	IV-I	Honors Elective - 4	3	0	0	3
6	IV-II	Technical Paper Writing	0	0	4	2
7	IV-II	Honors Elective -5	3	0	0	3
Total Credits						**20**

Honors Electives (E)	**Pre-Requisites**
Honors Elective - 1	
Waste to Energy Conversion	Power Systems I
Energy and its resources	Power Systems I
Electrical Safety and Quality Management	Power Systems I
Honors Elective - 2	
Advances in Distribution Systems	Power Systems I, Power Systems II
IoT Applications in Electrical Engineering	Basic Electrical Engineering
Energy Storage systems for renewable	Power Systems I
Honors Elective -3	
Smart Cities – Management of Smart Urban	Power Systems I, Power Systems II
Grid Integration of Renewable Energy Systems	Power Systems I, Power Systems II
Grid Integration of Electric Vehicles	Power Systems I, Power Systems II
Honors Elective - 4	
Cyber Security of Smart Grids	Smart Grids Planning and Operation
SCADA and Energy Management Systems	Power Systems I and Power Systems II
Distributed Generation and Micro Grids	Power Systems I and Power Systems II
Honors Elective - 5	
Smart Grid Protection	Smart Grids Planning and Operation
Electrical Safety Management	Basic Electrical Engineering
HVDC Transmission	Power Electronics, Power Systems

2.1.6 Department of Electronics & Communication Engineering

B.TECH HONORS IN ELECTRONICS & COMMUNICATION ENGINEERING

S. No.	Year/ Semester	Course Title	L	T	P	Credits
1	III-I	**Honors Elective -1** 1. High Speed Electronics 2. Nano electronics	3	0	0	3
2	III-II	Research Methodologies &Ethics	3	0	0	3
3	III-II	**Honors Elective – 2** 1. Wireless Sensor Networks 2. Error Correcting Codes	3	0	0	3
4	IV-I	**Honors Elective – 3** 1. Mixed Signal Processing 2. Adaptive Signal Processing	3	0	0	3
5	IV-I	**Honors Elective – 4** 1. Speech and Audio Signal Processing 2. Scientific computing	3	0	0	3
6	IV-II	Introduction to IOT	3	0	0	3
7	IV-II	Technical Paper Writing	0	0	4	2
Total Credits						**20**

2.1.7 Department of Computer Science and Engineering

B.TECH HONORS IN COMPUTER SCIENCE AND ENGINEERING

S. No	Year / Semester	Course to be chosen from/ studied	L	T	P	C
1.	III-I	**Honors Elective-1** 1. Principles of Programming Languages 2. Software Testing Methodologies 3. Computer Graphics	3	0	0	3
2.	III-II	**Research Methodologies**	3	0	0	3
3.	III-II	**Honors Elective-2** 1.Foundations of Machine Learning 2.Information Security 3.Software Project Management	3	0	0	3
4.	IV-I	**Honors Elective-3** 1.Big Data Analytics 2.Internet of Things 3.R Programming	3	0	0	3
5.	IV-I	**Honors Elective-4** 1.Advanced Databases 2.Neural Networks and Deep Learning 3.Natural Language Processing	3	0	0	3
6.	IV-II	**Technical Paper writing**	0	0	0	2
7.	IV-II	**Honors Elective-5** 1. Introduction to Data Science 2. Image Processing 3. Block Chain Technologies or MOOCS	0	0	0	3
Total Credits						20

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH I YEAR COURSE STRUCTURE
(Electrical & Electronics Engineering)
Semester – I

S. No	Course Code	Course Title	L	T	P	Credits
1	A221001	Mathematics-I(Linear Algebra & Calculus)	3	1	0	4.0
2	A221002	Applied Physics	3	1	0	4.0
3	A221081	Applied Physics Lab	0	0	3	1.5
4	A221501	C-Programming for Engineers	3	0	0	3.0
5	A221581	C-Programming for Engineers Lab	0	0	2	1.0
6	A221003	English for Skill Enhancement	2	0	0	2.0
7	A221082	English Language & Communication Skills Lab	0	0	2	1.0
8	A221201	Elements of Electrical& Electronics Engineering	0	0	2	1.0
9	A221381	Engineering Workshop	0	1	3	2.5
10		Induction Programme				
		Total	11	3	12	20

Semester – II

S. No	Course Code	Course Title	L	T	P	Credits
1	A222005	Mathematics–II (Ordinary Differential Equations & Vector Calculus)	3	1	0	4.0
2	A222006	Engineering Chemistry	3	1	0	4.0
3	A222084	Engineering Chemistry Lab	0	0	2	1.0
4	A222203	Electrical Circuits	3	1	0	4.0
5	A222282	Electrical Circuits Lab	0	0	2	1.0
6	A222303	Engineering Graphics & Modelling	1	0	4	3.0
7	A222583	Python Programming Lab	0	2	2	3.0
		Total	11	4	10	20

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH II YEAR COURSE STRUCTURE
(Electrical and Electronics Engineering)

Semester – I

S. No.	Course Code	Course Title	L	T	P	Credits
1	A223010	Complex Analysis and Fourier Transforms	3	1	0	4
2	A223205	Network Analysis	3	0	0	3
3	A223403	Analog Electronic Circuits	3	0	0	3
4	A223206	Electrical Machines-I	3	0	0	3
5	A223207	Electro Magnetic Fields	3	0	0	3
6	A223284	Electrical Machines Laboratory-I	0	0	2	1
7	A223285	Networks Laboratory	0	0	2	1
8	A223286	Electrical Simulation tools Laboratory	0	0	2	1
9	A223012	Professional Communication	2	0	0	1
		Total Credits	**17**	**1**	**06**	**20**

Semester - II

S. No.	Course Code	Course Title	L	T	P	Credits
1	A224209	Power System-I	3	0	0	3
2	A224210	Measurements and Instrumentation	3	0	0	3
3	A224211	Electrical Machines–II	3	0	0	3
4	A224409	Digital Electronics	2	0	0	2
5	A224212	Control Systems	3	0	0	3
6	A224288	Analog Electronic Circuits Laboratory	0	0	2	1
8	A224289	Measurements and Instrumentation Laboratory	0	0	2	1
9	A224290	Electrical Machines Laboratory-II	0	0	2	1
10	A2242P1	Real-time Research Project/ Field Based Project	0	0	4	2
11	A224013	Quantitative Methods and Logical Reasoning	2	0	0	1
		Total Credits	**16**	**0**	**10**	**20**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH III YEAR COURSE STRUCTURE
(Electrical and Electronics Engineering)
Semester - I

S.No.	Course Code	Course Title	L	T	P	Credits
1	A225213	Power Electronics	3	1	0	4
2	A225214	Power System-II	3	1	0	4
3	A225215	Microprocessors & Microcontrollers	3	0	0	3
4	A225216 A225217 A225218	IoT Applications in Electrical Engineering Electrical Energy Conservation and Auditing Cyber-Physical Systems	3	0	0	3
5	A225219 A225220	Sustainable Energy Power Applications of Electricity	3	0	0	3
6	A225487	Microprocessors & Microcontrollers Laboratory	0	0	2	1
7	A225291	Control Systems Laboratory	0	0	2	1
8	A225087	Advanced English Communication Skills Laboratory	0	0	2	1
9	A225016	Environmental Science	2	0	0	0
		Total Credits	**17**	**2**	**6**	**20**

Semester-II

S.No	Course Code	Course Title	L	T	P	Credits
1	A226018	Business Economics and Financial Analysis	3	0	0	3
2	A226223 A226224 A226225	AI Techniques in Electrical Engineering Modern Power Electronics Wind and Solar Energy systems	3	0	0	3
3	A226221	Power Semiconductor Drives	3	0	0	3
4	A226222	Power System Protection	3	0	0	3
5	A226292	Energy Conservation and Management Industrial Electrical Systems	3	0	0	3
6	A226293	Power Electronics Laboratory	0	0	2	1
7	A226294	Simulation of Power Converters Lab	0	0	2	1
8	A2262P1	Power System Laboratory	0	0	2	1
9	A226292	Industry Oriented Mini Project / Internship	0	0	4	2
10	A226019	Gender Sensitization	2	0	0	0
		Total Credits	**17**	**0**	**10**	**20**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH IV YEAR COURSE STRUCTURE
(Electrical and Electronics Engineering)

Semester-I

S.No.	Course Code	Course Title	L	T	P	Credits
1	A227228	Electric and Hybrid Vehicles	3	1	0	4
2	A227229	Power System Operation and Control	3	0	0	3
3	A227231 A227232 A227233	Power Quality & FACTS Solar Power Batteries Advanced Control of Electric Drives	3	0	0	3
4	A227234 A227235	Electric Vehicles and Hybrid Vehicles Energy Storage Systems	3	0	0	3
5	A227230	Essentials of Computer Networks	2	0	0	2
6	A227295	Simulation of Renewable Energy Systems Laboratory	0	0	4	2
8	A2272PS1	Project Stage–I	0	0	6	3
		Total Credits	**14**	**1**	**10**	**20**

Semester-II

S.No.	Course Code	Course Title	L	T	P	Credits
1	A228236	Utilization of Electrical Energy	3	0	0	3
2	A228237	Power Electronic Applications to Renewable Energy Systems	3	0	0	3
3	A228238 A228239 A228240	Smart Grid Technologies Machine Learning Applications to Electrical Engineering Embedded Systems	3	0	0	3
4	A2282PS2	Project Stage–II	0	0	20	9
5	A2282TS	Seminar	0	0	02	2
		Total Credits	**9**	**0**	**22**	**20**

Professional Elective - I

A225216	IoT Applications in Electrical Engineering
A225217	Electrical Energy Conservation and Auditing
A225218	Cyber Physical Systems

Professional Elective-II

A226223	AI Techniques in Electrical Engineering
A226224	Modern Power Electronics
A226225	Wind and Solar Energy systems

Professional Elective-III

A227231	Power Quality&FACTS
A227232	SolarPower Batteries
A227233	Advanced Control of Electric Drives

Professional Elective-IV

A228238	Smart Grid Technologies
A228239	Machine Learning Applications to Electrical Engineering
A228240	Embedded Systems

Open Electives offered by EEE Department

Open Elective-I

A225219	Sustainable Energy
A225220	Power Applications of Electricity

Open Elective-II

A226226	Energy Conservation and Management
A226227	Industrial Electrical Systems

Open Elective-III

A227234	Electric Vehicles and Hybrid Vehicles
A227235	Energy Storage Systems

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH I YEAR COURSE STRUCTURE
(Electrical & Electronics Engineering)

Semester – I

S. No	Course Code	Course Title	L	T	P	Credits
1	A221001	Mathematics-I(Linear Algebra & Calculus)	3	1	0	4.0
2	A221002	Applied Physics	3	1	0	4.0
3	A221081	Applied Physics Lab	0	0	3	1.5
4	A221501	C-Programming for Engineers	3	0	0	3.0
5	A221581	C-Programming for Engineers Lab	0	0	2	1.0
6	A221003	English for Skill Enhancement	2	0	0	2.0
7	A221082	English Language & Communication Skills Lab	0	0	2	1.0
8	A221201	Elements of Electrical& Electronics Engineering	0	0	2	1.0
9	A221381	Engineering Workshop	0	1	3	2.5
10		Induction Programme				
		Total	11	3	12	20

MATHEMATICS-I (LINEAR ALGEBRA AND CALCULUS)

Department of Humanities & Sciences				I B.Tech I Semester		
Course Code	Hours/Week		Credits	Marks		
A221001	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives:

To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

Course Outcomes:

After learning the contents of this course, the students must able to:

1. Write the matrix representation of system of linear equations and identify the consistency of the system of equations.
2. Find the Eigen values and Eigen vectors of the matrix and discuss the nature of the quadratic form.
3. Analyze the convergence of sequence and series.
4. Discuss the applications of mean value theorems to the mathematical problems, Evaluation of improper integrals using Beta and Gamma functions.
5. Examine the extrima of functions of two variables with/ without constraints.

Syllabus

UNIT-I Matrices and Linear System of Equations :

Introduction of Matrices, Rank - Echelon form, Normal form. Solution of Linear Systems – Gauss Elimination and LU Decomposition methods.

UNIT-II: Eigen Values and Eigen Vectors:

Eigen values, Eigen vectors – properties, Cayley-Hamilton Theorem (without Proof) - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonalization of matrix- Quadratic

forms: Nature, Index and Signature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: Sequences & Series:

Basic definitions of Sequences and series, Convergence and divergence, Ratio test, Comparison test, Cauchy's root test, Raabe's test, Integral test, Absolute and conditional convergence.

UNIT-IV: Improper Integrals and Mean Value Theorems:

Improper Integrals: Gamma and Beta Functions-Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.
Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Generalized Mean Value theorem (Taylor's and MacLaurin's Series all theorems without proof) – Geometrical interpretation of Mean value theorems.

UNIT-V: Functions of several variables:

Partial Differentiation: Total derivative, Functional dependence, Jacobian Determinant-Maxima and Minima of functions of two variables with constraints and without constraints, Method of Lagrange Multipliers.

Textbooks:

1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 36th Edition, 2010
2. Advanced Engineering Mathematics by Jain &Iyengar Narosa Publications.

Reference Books:

1. Calculus and Analytic geometry by G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics by Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2nd Edition) Michael D. Greenberg

APPLIED PHYSICS

Department of Humanities & Sciences				I B.Tech I Semester		
Course Code	Hours/Week		Credits	Marks		
A221002	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B.Tech I Year I Semester

Course Outcomes:

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

1. Understand various optical phenomena of light
2. Apply the basic principles of quantum mechanics to classify solids based on the band theory
3. Elucidate the characteristics of semiconductors and semiconductor devices
4. Apply the knowledge of nanotechnology for societal applications
5. Explain the working principle of lasers and optical fibers

Unit – I Wave Optics

Principle of superposition, coherence. Interference - Interference in thin films by reflection, Newton's rings. Diffraction – Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to single slit, Plane diffraction grating, Resolving power of grating (qualitative treatment). Polarization – Polarization of light waves, Plane of vibration, Plane of polarization, Double refraction, Nicol's Prism, Applications of polarization.

UNIT-II Introduction to Quantum Physics and Band theory of solids

Introduction to quantum physics: Planck's Law (qualitative treatment), wave-particle duality, de-Broglie hypothesis of matter waves, properties of matter waves, time independent Schrodinger equation, Born interpretation of wave function, particle in one dimensional potential box, Fermi-Dirac distribution.

Classical free electron Theory (Qualitative treatment)- merits and demerits, Bloch theorem, Kronig-Penny model (qualitative treatment), E-k diagram, effective mass of electron, Energy bands in solids, classification of materials into metals, semiconductors and insulators.

UNIT-III Semiconductors and Semiconductor devices

Intrinsic and extrinsic semiconductors- energy band diagram and position of fermi level (qualitative treatment).

Direct and indirect band-gap semiconductors, Formation of PN junction, energy level diagram of PN junction, I-V characteristics of PN junction diode; construction, working and characteristics of Photo diode, solar cell and light emitting diode, Hall effect and its applications

UNIT-IV Nanotechnology

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods-top-down fabrication: Ball milling, physical vapor

deposition (PVD), chemical vapor deposition (CVD), characterization techniques – basic principles of XRD, SEM, TEM; applications of nanomaterials.

UNIT-V Lasers and Fiber Optics

Introduction to interaction of radiation with matter: Absorption, spontaneous emission and stimulated emission, Einstein coefficients and their relations, characteristics of a laser, population inversion, important components of a laser: active medium, pumping source, optical resonator. Construction and working of Ruby laser, He-Ne laser and semiconductor laser, applications of lasers.

Introduction to optical fibers, total internal reflection, construction of optical fiber, acceptance angle and numerical aperture, step and graded index fibers, block diagram of optical fiber communication system, applications of optical fibers.

Text books:

1. A Text book of Engineering Physics by P K Palanisamy: Scietech publication.
2. Engineering Physics by V Rajendran, McGraw Hill Education.

Reference books:

1. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd dition,2022.
2. Essentials of Nanoscience & Nanotechnology by Narsimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.
3. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications.

APPLIED PHYSICS LAB

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221081	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B. Tech I Year I Semester

Course Outcomes:

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

1. Apply optical phenomena to characterize optical sources and components.
2. Characterize semiconductors and semiconductor devices.
3. Study transient response of RC circuit and resonance mechanisms in mechanical and electrical systems.
4. Collect data and evaluate the outcomes of an experiment quantitatively and qualitatively.
5. Carry out experimental data analysis.

LIST OF EXPERIMENTS

1. Newton's rings: Determination of the radius of curvature of a given plano-convex lens by forming Newton's rings.
2. Diffraction grating: Determination of wavelength of a given monochromatic source using a plane diffraction grating.
3. Dispersive power: Determination of dispersive power of given prism.
4. Single Slit Diffraction using Laser- Determination of wavelength of given Laser.
5. Energy gap of P-N junction diode: Determination of the energy gap of a semiconductor diode.
6. Light emitting diode: Study of V-I and P-I characteristics of a given light emitting diode.
7. Photo diode: Study of V-I characteristics of photo diode at different intensities.
8. Solar cell: Study of V-I characteristics of solar cell.
9. LCR Circuit: Determination of the resonance frequency of forced electrical oscillator in series and parallel.
10. RC- Circuit: Determination of the time constant of RC-circuit.
11. Optical fiber: a) Determination of the acceptance angle and numerical aperture of optical
    fiber.
    b) Estimation of attenuation in optical fiber
12. Method of least squares-Torsional pendulum.
    Note: Any 10 experiments are to be performed.

Reference books:

1. Engineering Physics Theory and Practical, C. K. Pandey, A. K. Katiyar.
2. Engineering Physics Lab Manual, C. V. Madhusudan Rao.

C-PROGRAMMING FOR ENGINEERS

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221501	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B.Tech. I Year I Semester

Course Outcomes:

At the end of this course, the student would be able to

1. Design Algorithms and Flowcharts for real world applications.
2. Know various operators and decision statements for Program development.
3 Design programs involving iteration statements and code reusability using Functions.
4. Develop programs using arrays and identify various string handling functions.
5. Analyze various searching and sorting techniques.

UNIT - I:

Introduction: Introduction to Computers, Number Systems & Conversions, Algorithms, Flowcharts.

Overview of C Language: Introduction, Salient Features of C Language, Structure of a "C" Program.

C Language Preliminaries: Keywords and Identifiers, Constants, Variables, Data Types, and Input / Output Statements with suitable illustrative "C" Programs.

UNIT - II:

Operators: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associatively with suitable illustrative "C" Programs.

Conditional/Decision Statements: if, if-else, Nested if-else, else-if ladder, and Switch-Statement with suitable illustrative "C" Programs.

UNIT - III:

Loop Control Statements: while, do-while and for with suitable illustrative "C" Programs, break, continue.

Pointers: Defining pointers, increment & decrement operations, Pointer to Pointers.

Functions: Introduction to Functions, benefits of functions, types of functions, Function calls, return Statement, Parameter Passing mechanism: Call-by-Value, Call-by-reference Recursion, Storage Classes.

UNIT - IV:

Arrays: Introduction to Arrays, One-Dimensional Arrays, Two-Dimensional Arrays, Arrays and Functions, Pointers and Arrays.

Strings: Introduction to Strings, String I/O, String Manipulation Functions (strlen( ), strcmp( ),

strcat( ),strcpy( ) , strrev( ), toupper(), tolower()).

UNIT - V:

Structures: Definition and Initialization of Structures, Accessing structure members, Unions, typedef.
Searching and Sorting: Linear Search, Binary Search, Bubble Sort, Insertion Sort.
Data Structures: Introduction, Stacks, Queues.

TEXT BOOKS:

1. B.A.Forouzon and R.F. Gilberg, “COMPUTER SCIENCE: A Structured Programming Approach Using C”, Third edition, CENGAGE Learning, 2016.
2. Ashok N. Kamthane, “C and Data Structures”, Pearson Education. 2010.

REFERENCE BOOKS:

1.M.T.Somashekara, “Problem Solving Using C”, PHI, 2nd Edition 2009.
2. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press .
3. PradipDey and Manas Ghosh, "Programming in C 2/e", Oxford University Press, 2nd Edition 2011.
4. Rajaraman V., "The Fundamentals of Computers", 4th Edition,Prentice Hall of India, 2006.
5. R S Bichker, "Programming in C", University Press, 2012.

C-PROGRAMMING FOR ENGINEERS LAB

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221581	L	T	P	C	CIE	SEE	Total
	0	0	2	1.0	40	60	100

B.Tech. I Year I Semester

Course Outcomes:

At the end of this course, the student would be able to

1. Apply the specification of syntax rules for numerical constants, variables and data types.
2. Know the usage of various operators and design programs on decision Statements.
3. Design programs on loop control statements, pointers and code reusability using functions.
4. Develop programs on array and strings.
5. Implement programs on structures and various searching and sorting techniques.

Week 1

Ubuntu and Linux Commands.

Week 2

Designing of flowcharts and algorithms

1. Areas of Polygons.
2. Calculation of Simple and Compound Interest.
3. Swapping of Two numbers with and without temporary variable.
4. Checking whether a number is even or odd.
5. Sum of first ‘n’ natural numbers.
6. Checking a number whether it is divisible by any given number.
7. Evaluation of mathematical expressions.
8. Programs using scanf( ) and printf( ) statements.
9. Program to find the roots of quadratic equation.

Week 3

Programs on operators.(min 9 programs)

Programs on precedence and Associativity & Type conversions.

Programs on Conditional Statements or Decision Statements.(12)

Week 4,5,6

Programs on Loop Control Statements.(12)

Programs on Pointers, pointer arithmetic, pointer to pointer (6).

Programs on Functions, Recursion& Storage classes.(8)

Week 7,8

Programs on One Dimensional Arrays. (3)

Programs on Two Dimensional Arrays. (2)

Programs on Arrays and Functions, Pointer to Array.

Programs on Strings with string built-in or manipulation Functions.(8)

Week 9,10,11

Programs on Accessing Structures.(4)

Programs on Unions, typedef(4)

Implementation of Linear Search and Binary Search.

Implementation of Bubble Sort and Insertion Sort

ENGLISH FOR SKILL ENHANCEMENT

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221003	L	T	P	C	CIE	SEE	Total
	2	0	0	2	40	60	100

B. Tech I Year I Semester

Course Objectives:

This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

Course Outcomes:

Students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for oral and writtencommunication.
3. Demonstrate understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages through effective reading strategies.
5. Construct paragraphs, letters, essays, abstracts, précis and reports in various contexts thereby improving proficiency in writing modules of English.

UNIT - I

Chapter entitled '***Toasted English***' **by R.K.Narayan** from ***"English: Language, Context and Culture"*** published by Orient Black Swan, Hyderabad.

Vocabulary: The Concept of Word Formation - The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance - Techniques for Effective Reading.

Writing: Sentence Structures - Use of Phrases and Clauses in Sentences - Importance of Proper Punctuation - Techniques for Writing precisely – Paragraph Writing -Types, Structures and Features of a Paragraph - Creating Coherence - Organizing Principles of Paragraphs in Documents.

UNIT - II

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture" published*** by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreementand Subject-Verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing - Defining/Describing People, Objects, Places and Events – Classifying - Providing Examples or Evidence.

UNIT - III

Chapter entitled **'Lessons from Online Learning' by F. Haider Alvi, Deborah Hurst et al** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises forPractice.

Writing: Format of a Formal Letter - Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion – Précis Writing.

UNIT - V

Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports - Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

TEXTBOOK:

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
3. Vishwamohan, Aysha. (2013). English for Technical Communication for EngineeringStudents. Mc Graw-Hill Education India Pvt. Ltd.
4. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221082	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech I Year I Semester

Course Objectives:

1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in students' pronunciation ofEnglish by providing an opportunity for practice in speaking
4. To improve the fluency of students in spoken English and neutralize the impact ofdialects.
5. To train students to use language appropriately for public speaking, groupdiscussions and interviews

Course Outcomes:

Students will be able to:

1. Reproduce speech sounds and improve language
2. Develop accent and pronunciation in various situations
3. Understand variants in pronunciation by differentiating between British and American accents
4. Identify the diverse purposes of listening and speaking
5. Exhibit critical thinking, problem-solving and decision-making skills through Group Discussions

Exercise I

CALL Lab:

Understand: Listening Skill- its importance-Purpose-Process-Types-Barriers-Effective Listening.

Practice: Introduction to Phonetics- Speech Sounds- Vowels and Consonants- Minimal Pairs - Consonant Clusters - Past Tense Marker and Plural Marker - *Testing Exercises*

ICS Lab:

Understand: Spoken vs. Written language - Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise II

CALL Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress patternin sentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requestsand Seeking Permissions - Telephone Etiquette.

Exercise III

CALL Lab:

Understand: Errors in Pronunciation-Neutralizing Mother Tongue Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and AmericanPronunciation - *Testing Exercises*

ICS Lab:

Understand: Descriptions – Narrations - Giving Directions and Guidelines – Blog Writing

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thankingand Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise IV

CALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests - *Testing Exercises*

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication - Presentation Skills.

Practice: Making a Short Speech – Extempore - Making a Presentation.

Exercise V

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:

Understand: Group Discussion

Practice: Group Discussion

REFERENCE BOOKS:

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* CambridgeUniversity Press
3. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.*Orient Black Swan Pvt. Ltd.

ELEMENTS OF ELECTRICAL & ELECTRONICS ENGINEERING

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221201	L	T	P	C	CIE	SEE	Total
	0	0	2	1	50	-	50

B.Tech. I Year I Semester

Course Outcomes:

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

1. Understand the fundamentals of basic circuit components and connections.
2. Demonstrate the usage of electrical measuring instruments.
3. Classify the types of electronic components.
4. Explain the parts of electrical machines.
5. Interpret the operation of power converters and the components of control systems.

LIST OF EXPERIMENTS

Any ten experiments from the following should be conducted

1. Demonstrate the usage of DC, AC supplies and their applications.
2. Demonstrate the usage of basic electrical circuit components (Resistor, Inductor and Capacitor) and identification of these components and their applications.
3. Demonstrate series and parallel connections
4. Demonstrate the usage of measuring Instruments Voltmeters, Ammeters, Wattmeter, CRO, tachometer and Multimeters.
5. Demonstrate the different types of Electrical Wiring.
6. Demonstrate Earthing and Grounding practices.
7. Demonstrate the Identification of Electronic devices (Diode, BJT, FET, MOSFET, IGBT and SCR), their terminals and connections.
8. Demonstrate the operation of half wave and full wave diode rectifiers
9. Demonstrate different types and ratings of electrical cables
10. Demonstrate the construction of DC Machines
11. Demonstrate the construction of AC Machines
12. Demonstrate the Components of control systems and understand their functions.
13. Demonstrate the operation of different types of power converters and their applications.

ENGINEERING WORKSHOP

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A221381	L	T	P	C	CIE	SEE	Total
	0	1	3	2.5	40	60	100

B. Tech. I Year I Semester

Course Outcomes:

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

1. Understanding the tools and methods of using to fabricate engineering Components.
2. Applying the measuring techniques to verify the dimensional accuracy.
3. Evaluating various methods and trades of workshop in the component building.

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

1. Carpentry – T-Lap Joint, Dovetail Joint & Tenon Joint.
2. Fitting – V-Fit, Step Cutting & Flat Filling.
3. Tin-Smithy – Open Scoop, Rectangular Tray & Conical Funnel.
4. Foundry – Preparation of Green Sand Mould using Single Piece and Split Pattern.
5. Welding Practice – Arc Welding – Lap Joint & Butt Joint.
6. House-wiring – Parallel Connection, Series Connection & Two-way Switch.

2.TRADES FOR DEMONSTRATION & EXPOSURE

Plumbing, Machine Shop, Power tools in construction and Wood Working

TEXT BOOKS:

1. Manufacturing Engineering and Technology, Kalpakjian S. and Steven S. Schmid, 4th edition, Pearson Education India Edition, 2002.
2. Elements of Workshop Technology, Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH I YEAR COURSE STRUCTURE
(Electrical & Electronics Engineering)

Semester – II

S. No	Course Code	Course Title	L	T	P	Credits
1	A222005	Mathematics–II (Ordinary Differential Equations & Vector Calculus)	3	1	0	4.0
2	A222006	Engineering Chemistry	3	1	0	4.0
3	A222084	Engineering Chemistry Lab	0	0	2	1.0
4	A222203	Electrical Circuits	3	1	0	4.0
5	A222282	Electrical Circuits Lab	0	0	2	1.0
6	A222303	Engineering Graphics & Modelling	1	0	4	3.0
7	A222583	Python Programming Lab	0	2	2	3.0
		Total	11	4	10	20

MATHEMATICS II (ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS)

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222005	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B.Tech I Year II Semester
Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives:

To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions

The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course Outcomes:

After learning the contents of this course the students must be able to:

1. Classify the various types of differential equations of first order and first degree and apply the concepts of differential equations to the real-world problems.
2. Solve higher order differential equations and apply the concepts of differential equations to the real-world problems.
3. Find the Laplace Transform of various functions and apply to find the solutions of differential equations.
4. Evaluate the multiple integrals and identify the vector differential operators physically in engineering problems.
5. Evaluate the line, surface and volume integrals and converting them from one to another by using vector integral theorems.

UNIT-I:

First order Ordinary Differential Equations and their Applications:

Introduction to ODE, Exact, Linear and Bernoulli, Applications of ODE: Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

UNIT-II:

Higher Order Linear Differential Equations:

Linear differential equations of second and higher order with constant coefficients, RHS term of the type f(X) $= e^{ax}, \sin ax, \cos ax$ *and* $x^k, e^{ax}V(x), x^kV(x)$. Method of variation of parameters, Equations reducible to Linear ODE with constant coefficients: Cauchy-Euler Equation and Legendre's Equations.

Applications: Electric Circuits.

UNIT-III:

Laplace transforms:

Laplace transform of standard functions – Inverse transform – first shifting Theorem, transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function - Differentiation and integration of transforms – Application of Laplace transforms to ordinary differential equations.

UNIT-IV:

Multiple Integrals & Vector Differentiation:

Multiple integrals - double and triple integrals – change of order of integration (Only Cartesian form)- change of variables (Cartesian to Polar for double integral, Cartesian to Spherical for triple integral). Gradient- Divergence- Curl and their related properties - Potential function - Laplacian and second order operators.

UNIT-V:

Vector Integration:

Line integral, work done, Surface and Volume integrals. Vector integrals theorems: Green's, Stoke's and Gauss Divergence Theorems (Only Statements & their Verifications).

Textbooks:

1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 36th Edition, 2010
2. Advanced Engineering Mathematics by Jain &Iyengar, Narosa Publications.

Reference Books:

1. Calculus and Analytic geometry by G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics by Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.

3. Advanced Engineering Mathematics (2nd Edition) by Michael D. Greenberg

ENGINEERING CHEMISTRY

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222006	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B.Tech I Year II Semester

Course Objectives :

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion - it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

Course Outcomes:

The students will able to

1. understand the basic properties of water and its usage in domestic and industrial purposes.
2. acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
3. learn the fundamentals and general properties of polymers and other engineering materials.
4. acquire knowledge of various energy sources.
5. apply the knowledge of engineering materials in daily life.

UNIT - I: Water and its treatment: (10)

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation - Determination of F^- ion by ion- selective electrode method.

Boiler Troubles - Introduction. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange process. Desalination of Brackish water - Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion: (11)

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of Zn-air and Lithium-ion battery. Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting

corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode & impressed current methods and Electroless plating.

UNIT - III: Polymeric materials: (9)

Definition – Classification of polymers with examples – Types of polymerizations –

addition and condensation polymerization with examples – Nylon 6:6, Terylene
Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC, Bakelite and Teflon.

Rubbers: Natural rubber and its vulcanization.

Synthetic Rubbers- Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples- mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages – Poly lactic acid and poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources: (9)

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula, Numerical problems. Classification- Solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Trans esterification and advantages.

UNIT - V: Engineering Materials: (9)

Cement: Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermo response materials- Poly acryl amides and Poly vinyl amides

Lubricants: Classification of lubricants with examples-characteristics of a good lubricant - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpat rai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.

REFERENCE BOOKS:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

ENGINEERING CHEMISTRY LABORATORY

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222084	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B.Tech I Year II Semester

Course Objectives:

The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

1. Estimation of hardness and chloride content of water to check its suitability for drinking purpose.
2. To perform estimation of acids and bases using conductometry, potentiometry and pH metry methods.
3. To prepare polymers such as Thiokol rubber and Nylon-6 in the laboratory.
4. Skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course Outcomes:

The experiments will make the student gain skills on:

1. Determination of parameters like hardness and Chloride content of water.
2. Determination of rate of corrosion of mild steel in various conditions.
3. To perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
4. To prepare polymers like Thiokol rubber and Nylon-6.
5. Estimation of Saponification value, Viscosity and Surface tension of lubricant oils.

Choice of 8-10 Experiments from the following:

1. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.
2. **Corrosion:** Determination of rate of corrosion of mild steel in various conditions.
3. **Conductometry:**
   a. **1.**Estimation of the concentration of an acid by Conductometry.
   b. **2.**Estimation of the concentration of Mixture of acids by conductometry
4. **Potentiometry:**
   a. Estimation of the Concentration of an acid by potentiometry
   b. Estimation of the amount of Fe^{+2} by Potentiometry
5. **pH Metry:** Determination of an acid concentration using pH meter.

6. **Argentometry:** Estimation of Chloride content of water by argentometry

7. Preparations:

a. Preparation of Thiokol rubber.
b. Preparation Nylon – 6.

I. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.
3. Estimation of Surface tension of lubricant oil using Stalagmometer.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publication

ELECTRICAL CIRCUITS

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222203	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B.Tech I Year II Semester

Course Outcomes:

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

1. Understand the fundamentals of basic circuit components, laws and their usage.
2. Apply basic electrical circuit concepts.
3. Analyse locus diagrams of RL and RC circuits.
4. Use Network theorems to solve electrical circuits.
5. Evaluate networks using topology and assess inductance in coupled circuits

UNIT- I

Network Elements & Laws: Active elements, Independent and dependent sources. Passive elements- R, L and C, Energy stored in inductor and capacitor, Ohm's Law, Kirchhoff's laws, Source transformations, Star-delta transformations, Mesh analysis, Nodal analysis including supermesh and super node analysis

UNIT- II

Single-Phase Circuits – I: RMS and average values of periodic sinusoidal and non- sinusoidal waveforms, Phasor representation, Steady-state response of series, parallel and series-parallel circuits. Impedance, Admittance.

UNIT- III

Single-Phase Circuits – II: Current locus diagrams of RL and RC series and parallel circuits with variation of resistance. Resonance: Series and parallel circuits, Bandwidth and Q-factor.

UNTI- IV

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Millman's theorem and Reciprocitytheorem. (AC & DC).

UNIT- V

Coupled circuits: Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of circuits with mutual inductance.

Topological Description of Networks: Graph, tree, chord, cut-set, incident matrix, circuit matrix andcut-set matrix,

TEXT BOOKS:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGrawHill, 2nd Edition, 2019

REFERENCE BOOKS:

1. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGrawHill, 5th Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGrawHill, 6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.

ELECTRICAL CIRCUITS LABORATORY

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222282	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B.Tech I Year II Semester

Course Outcomes:

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

1.Use Ohms law and other electrical concepts to design circuits.
2. Verify network theorems.
3. Analyse electrical circuits with the help of mesh and nodal analysis.
4. Assess the operation of electrical circuits.
5. Outline the parameters of various electrical circuits.

List of experiments

Any ten experiments from the following should be conducted

1. Verification of Ohm's Law
2. Determination of equivalent resistance, current and voltage across each element in a given circuit.
3. Verification of KVL and KCL
4. Verification of Mesh Analysis
5. Verification of Nodal Analysis
6. Verification of Thevenin's theorem
7. Verification of Norton's theorem
8. Verification of Superposition theorem
9. Verification of Reciprocity Theorem.
10. Verification of Millman's Theorem
11. Verification of Maximum Power Transfer Theorem.
12. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits

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ENGINEERING GRAPHICS & MODELING

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222303	L	T	P	C	CIE	SEE	Total
	1	0	4	3	40	60	100

B.Tech I Year II Semester

Course Outcomes:

1. Comprehend the concepts of engineering drawing and CAD software.
2. Conceptualize and draw the projections of points and straight lines.
3. Visualize and project different views of a planes and solids.
4. Evaluate the surfaces of solids developed for further processing in the engineering applications.
5. Generate isometric and corresponding orthographic views of any given component.

UNIT- I:

Introduction To Engineering Drawing: Principles of engineering graphics and their significance, usage of drawing instruments, conic sections, including the rectangular hyperbola– general method only. Cycloid, Epicycloid, Hypocycloid. Scales – plain & diagonal only.

INTRODUCTION TO CAD: Introduction to CAD software and its importance, standard toolbar/menus and navigation tools used in the software.

UNIT- II:

Principles Of Orthographic Projections: Conventions. Projections of points.

Projections Of Lines: (first angle projection) inclined to both planes (traces and midpoint problem to be excluded).

Implementation Of CAD: Drawing orthographic projections of points and lines using a CAD package.

UNIT – III:

Projections Of The Planes: Projections of regular planes inclined to both the planes.

Projections Of Solids: Projections of regular solids inclined to both the planes (prisms, pyramids, cones and cylinders, Change of potion method only).

Implementation In CAD: Drawing orthographic projection of planes and regular solids using a CAD package.

UNIT- IV:

Sections And Sectional Views of Right Angular Solids: Prism, Cylinder, Pyramid, Cone.

Development Of Surfaces of Right Regular Solids: Prism, Pyramid, Cylinder and Cone.

Implementation In CAD: Drawing sectional views of solids and the development of right regular solids using a CAD package.

UNIT-V:

Principles Of Isometric Projection: Isometric scale, isometric views, conventions, isometric views of lines, planes, simple solids. Conversion of orthographic views to isometric views.
Orthographic Projections: conversion of isometric views to orthographic views.
Implementation In Cad: Drawing isometric views from giving orthographic views and vice-versa using a CAD package.

TEXT BOOKS:

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R., Charotar Publishing House.

REFERENCE BOOKS:

1. Text book on Engineering Drawing, Narayana, K.L. & P. Kannaiah, Scitech Publishers.
2. Engineering Drawing and Computer Graphics, Shah, M.B. & Rana B.C, Pearson Education.
3. http://docs.autodesk.com/ACDMAC/2013/ENU/PDFs/acdmac_2013_users_guide.pdf

PYTHON PROGRAMMING LAB

Department of Humanities & Sciences					I B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A222583	L	T	P	C	CIE	SEE	Total
	0	2	2	3	40	60	100

B. Tech I Year II Semester

Course Outcomes:

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

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Implement programs using modular approach, file I/O, Python standard library

Week -1 (Installation & Simple Applications)

1. i) Use a web browser to go to the Python website http://python.org. This page contains informationabout Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.

Week - 2: (Mathematical Expressions & I/O Operations)

1. i) Write a program to calculate compound interest when principal, rate and number of periods aregiven.
   ii) Given coordinates (x1, y1), (x2, y2), find the distance between these two points.
2. Read name, address, email and phone number of a person through keyboard and print the details.

Week – 3 (Conditional statements)

1. Write a Program to find the given number is even or odd.
2. Write a program to find the maximum of three numbers (use 'if-elif-else' ladder).

Week – 4 (Loop Statements)

1. Write a program to Print the Fibonacci sequence using while loop.
2. Write a program to Print the below triangle using for loop:

   5
   4 4
   3 3 3

2 2 2 2

1 1 1 1 1

3. Write a program to print all prime numbers in a given interval (using break statement).

Week – 5 (List, Tuple, Dictionary)

1. i) Write a program to illustrate operations of List & Tuple
   ii) Write a program to find common values between two lists.
2. Write a program to perform addition of two matrices.
3. Write a program to read dictionary values from the user and find an element using given key.

Week – 6 (Functions & Modules)

1. Write a function called is_sorted that takes a list as a parameter and return True if the list is sortedin ascending order and False otherwise.
2. Write a function called GCD that takes parameters **a** and **b** and return their greatest common divisor.
3. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.

Week –7(Strings)

1. Write a program to add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
2. Write a program to remove the given word in all the places in a string?
3. Write a function that takes a sentence as an input parameter and replaces the first letter of everyword with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

Week–8 (Classes & objects)

1. Write a program to add two complex numbers using classes and objects
2. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draw a representation of the Rectangle on the Canvas.

Week– 9 (Inheritance)

1. Write a program to demonstrate the various types of Inheritances.

Week– 10(File Concepts)

1. Write a program to merge two given file contents into a third file.
2. Write a program to Read text from a text file, find the word with most number of occurrences
3. Write a program that reads a file *file1* and displays the number of words, number of vowels, and blank spaces.

Week – 11(Packages)

1. a) Install NumPy package with pip and explore it.
   b) Illustrate 1-D and 2-D vector processing and slicing.

2. Explore matplotlib with plotpy and visualize the data.

TEXT BOOKS:

1. "Python Programming- Using Problem Solving Approach", Reema Thareja, Oxford
2. "Python Programming-Problem Solving, Packages and Libraries", Anurag Gupta, G.P. Biswas, Mc Graw Hill

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH II YEAR COURSE STRUCTURE
(Electrical and Electronics Engineering)

Semester – I

S. No.	Course Code	Course Title	L	T	P	Credits
1	A223010	Complex Analysis and Fourier Transforms	3	1	0	4
2	A223205	Network Analysis	3	0	0	3
3	A223403	Analog Electronic Circuits	3	0	0	3
4	A223206	Electrical Machines-I	3	0	0	3
5	A223207	Electro Magnetic Fields	3	0	0	3
6	A223284	Electrical Machines Laboratory-I	0	0	2	1
7	A223285	Networks Laboratory	0	0	2	1
8	A223286	Electrical Simulation tools Laboratory	0	0	2	1
9	A223012	Professional Communication	2	0	0	1
		Total Credits	**17**	**1**	**06**	**20**

COMPLEX ANALYSIS AND FOURIER TRANSFORMS

Department of Electrical and Electronics Engineering					II B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A223010	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Pre-requisites: Electric Circuits

Course Outcomes:

After going through this course the student will be able to:

CO1. Work with the functions of complex variables and evaluation of complex differentiation.

CO2. Acquire the knowledge of complex power series and integration.

CO3. Apply the knowledge of contour integration to evaluate real integrals in engineering problems and acquire the knowledge of evaluating of conformal mapping and bilinear transformations.

CO4. Studying of Fourier series and defining it for various types of functions.

CO5. Apply Fourier sine and cosine integral theorems for a given function f(x) evaluate Fourier transforms, sine and cosine transforms.

Syllabus

UNIT I : FUNCTIONS OF COMPLEX VARIABLES

Introduction, Complex functions - limits and Continuity-Differentiability, Analytic functions and Properties, Cauchy-Riemann Equations (Cartesian and Polar), Harmonic functions, Construction of analytic functions.

UNIT II : UNIT-II: COMPLEX INTEGRATION

Introduction, Complex integration-Line integral, Cauchy's integral theorem, Cauchy's integral formula, Generalized Cauchy's integral formula, Power series: Taylor's series, Laurent series, Singular points, Types of Singularities, Residue, Cauchy's Residue theorem.

UNIT III : EVALUATION OF INTEGRALS & CONFORMAL MAPPING

Introduction,-Evaluation of improper real integrals of the type (a) $\int_{\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(cos\theta, sin\theta)d\theta$ - Conformal Mapping,-Critical Points-Bilinear transformation – fixed point – cross ratio - properties - invariance of circles.

UNIT IV : FOURIER SERIES

Introduction- Periodic functions- Fourier series of periodic function- Dirichlet's conditions- Even and odd functions- Change of interval- Half-range sine and cosine series.

UNIT V : FOURIER TRANSFORMS

Introduction- Fourier integral theorem (without proof)- Fourier integrals in complex form- Standard results- Fourier sine and cosine integrals- Fourier Transforms- Infinite and finite

Fourier Transforms- Properties- Fourier sine and cosine transforms- inverse transforms, Finite Fourier transforms.

TEXT BOOKS/REFERENCES:

1. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.
2. Functions of Complex Variables by J.N.Sharma
3. B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Advanced Engineering Mathematics : Kreyszig, John Wiley & sons
5. Fundamentals of Complex Analysis by Saff, E. B. and A. D. Snider, Pearson.
6. Advanced Engineering Mathematics by Louis C. Barrett, McGraw Hill.
7. A text book of Engineering Mathematics : N.P.bali, Manesh Goyal

NETWORK ANALYSIS

Department of Electrical and Electronics Engineering				II B.Tech I Semester		
Course Code	Hours/Week		Credits	Marks		
A223205	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

Pre-requisites: Electric Circuits

Course Outcomes:

After going through this course the student will be able to:

CO6. Obtain two port network parameters for applications.

CO7. Observe the transient response of various R, L and C circuits for different excitations.

CO8. Observe the transient response of various R, L and C circuits for different excitations using Laplace Transforms

CO9. Examine the behavior of polyphase circuits.

CO10. Design of various filters

Syllabus

UNIT-I: Two port network parameters:

Open circuit impedance, short-circuit admittance, Transmission, Hybrid parameters & inter-relationships, Series, parallel and cascade connection of two port networks,System function, and Impedance and admittance functions.

UNIT-II: Transient analysis:

Transient response of R, L & C circuits, Formulation of integral differential equations, Initial conditions, Transient Response of RL, RC and RLC (series and parallel) networks subjected to internal energy, Response to impulse, step, and ramp, exponential and sinusoidal excitations.

UNIT-III: Electrical circuit Analysis using Laplace Transforms:

Application of Laplace Transforms to RL, RC and RLC (series and parallel) Networks for impulse, step, and ramp, exponential and sinusoidal excitations.

UNIT-IV: Poly-phase Circuits:

Analysis of balanced and unbalanced 3-phase circuits, Star and deltaconnections, measurement of three-phase power for balanced and unbalanced loads.

UNIT-V: Filters:

Classification of filters – Low pass, High pass, Band pass and Band Elimination, Constant-k and M-derived filters-Low pass and High pass Filters and Band pass and Band elimination filters (Elementary treatment only)

TEXTBOOKS:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGrawHill, 2nd Edition, 2019.

REFERENCE BOOKS:

1. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
2. James W. Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGrawHill, 5th Edition, 2017.

ANALOG ELECTRONIC CIRCUITS

Department of Electrical and Electronics Engineering				II B.Tech I Semester		
Course Code	Hours/Week		Credits	Marks		
A223403	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Pre-requisites: Physics

Course Outcomes:

After going through this course the student will be able to:

CO1. Demonstrate the concepts of semiconductor theory.
CO2. Interpret the characteristics of different semiconductor devices with its applications.
CO3. Apply different biasing techniques of transistors for amplification.
CO4. Analyze transistor amplifiers using small signal model.
CO5. Describe the behaviour of special purpose diodes.

Syllabus

UNIT I :

Diode: PN junction Diode – Characteristics, Current equation, Temperature dependence, Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances.

Diode Applications: Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive Filter, Clippers and Clampers.

UNIT II : Bipolar Junction Transistor (BJT):

Principle of Operation and characteristics - Common Emitter, Common Base, Common Collector Configurations, Operating point, DC & AC load lines, Transistor Hybrid parameter model, Determination of h-parameters from transistor characteristics, Conversion of h-parameters.

UNIT III : Transistor Biasing and Stabilization:

Bias Stability, Fixed Bias, Collector to Base bias, Self Bias, Bias compensation using Diodes and Transistors.

Analysis and Design of Small Signal Low Frequency BJT Amplifiers: Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.

UNIT IV : Junction Field Effect Transistor:

Construction, Principle of Operation, Pinch-Off voltage, Volt-Ampere characteristics, comparison of BJT and FET, Biasing of FET, FET as voltage variable resistor, MOSFET construction and its characteristics in enhancement and depletion modes.

UNIT V : FET Amplifiers:

Small Signal Model, Analysis of CS, CD, CG JFET Amplifiers. Basic Concepts of MOSFET Amplifiers.

Special Purpose Devices: Zener Diode - Characteristics, Voltage Regulator; Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.

TEXT BOOKS:

1. Electronic devices and circuits, Millman & Halkias, McGraw Hill , 2007.
2. Electronic Devices and Circuits, S. Salivahanan, N. Suresh Kumar, A. Vallavaraj , Tata Mc Graw Hill , 2008.

REFERENCE BOOKS:

1. Electronic Devices and Circuits, Boylestad R L & Louis Nashelsky, Prentice Hall India, 2006.
2. Electronic Devices and Circuits, Gupta J B, S. K. Kataria, 2009.

ELECTRICAL MACHINES-I

Department of Electrical and Electronics Engineering				II B.Tech I Semester		
Course Code	Hours/Week		Credits	Marks		
A223206	L	T	P	C	CIE	SEE	Total
	3	1	0	3	40	60	100

Pre-requisites: Electric Circuits

Course Outcomes:

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

CO1. Understand different parts of DC Generators & understand its operation.
CO2. Explain the operation of DC motors.
CO3. Illustrate the different testing methods of DC machines.
CO4. Examine the constructional and operation of single phase transformers.
CO5. Analyze three phase transformers connections.

UNIT – I : D.C. Generators:

Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E.M.F Equation. Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation. Methods of Excitation – separately excited and self-excited generators – build-up of E.M.F - critical field resistance and critical speed - causes for failure of self-excitation and remedial measures. Load characteristics of shunt, series and compound generators.

UNIT – II : D.C Motors:

Principle of operation – Back E.M.F. - Torque equation – characteristics and applications of shunt, series and compound motors – Necessity of starter, principle of operation of 3-point and 4-point starters with protective devices ,Speed control of D.C. Motors - Armature voltage and field flux control methods.

UNIT – III: Testing of DC Machines:

Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency. Methods of Testing – direct, indirect, and regenerative testing – Brake test – Swinburne's test – Hopkinson's test – Field's test - separation of stray losses in a d.c. motor.

UNIT – IV : Single Phase Transformers:

Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no load and on load - phasor diagrams Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency & supply voltage on iron losses.

UNIT – V : Testing of Transformers and Poly-Phase Transformers:

OC and SC tests - Sumpner's test -predetermination of efficiency and regulation-separation of core losses-parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers. Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/ Δ and open Δ

TEXT BOOKS:

1. Theory and Performance of Electrical Machines, J.B. Gupta , S.K.Kataria & Sons , 2013.
2. Electrical Machines, R.K.Rajput Laxmi Publications (P) Ltd, 2004.

REFERENCE BOOKS:

1. Electrical Machinery, P. S. Bimbhra, Khanna Publishers, 2011.
2. Electric Machines, I. J. Nagrath and D. P. Kothari McGraw Hill Education, 2010.
3. Electrical Machines III, M.V.Bakshi & U.A.Bakshi, Technical Publications.

ELECTRO MAGNETIC FIELDS

Department of Electrical and Electronics Engineering				II B.Tech I Semester			
Course Code	Hours/Week			Credits	Marks		
A223207	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Pre-requisuites: Electric Circuits

Course Outcomes:

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

CO1. Understand the basic laws of electromagnetism.
CO2. Compare the electric and magnetic fields concepts for simple configurations under static conditions.
CO3. Illustrate time varying magnetic fields.
CO4. Examine Maxwell's equations in different forms and different media.
CO5. Apply electromagnetic concepts to electrical machines.

UNIT – I : ELECTROSTATICS:

Vector Algebra - Coordinate Systems - Divergence theorem. Electrostatic Fields - Coulomb's Law - Electric Field Intensity (EFI) - EFI due to a line and a surface charge, 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, Maxwell's first law, Laplace's equations and Poison's equations.

UNIT - II : DIPOLE& CAPACITANCE:

Electric Dipole, Dipole moment, Polarization, Potential due to an Electric Dipole and Torque. Capacitance - Capacitance of parallel plate, spherical and co-axial capacitors with composite dielectrics. Energy stored and energy density in static electric field. Current density, conduction and Convection current densities, Ohm's law in point form, Equation of continuity.

UNIT – III : MAGNETO STATICS, AMPERE'S CIRCUITAL LAW:

Biot-Savart's law - Magnetic field intensity (MFI) - MFI due to a straight current carrying filament- MFI due to circular and solenoid current Carrying wire, Relation between magnetic flux, magnetic flux density, Maxwell's second Equation.**Ampere's circuital Law & Applications:** Ampere's circuital law and its applications viz. - MFI due to an infinite sheet of current and a long current carrying filament, Point form of Ampere's circuital law - Curl-Stroke's Theorem, Maxwell's third equation.

UNIT – IV: FORCE IN MAGNETIC FIELDS, MAGNETIC POTENTIAL:

Magnetic force - Lorentz force equation – force on a current element in a magnetic field - Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – Torque in a magnetic field. Scalar Magnetic potential and its limitations, vector magnetic potential and its properties.

UNIT - V : INDUCTANCE, TIME VARYING FIELDS:

Self and Mutual inductances, Determination of self-inductance of a solenoid, toroid and mutual inductance between a straight long wire, Energy stored and Density in a Magnetic field. Time varying fields - Faraday's laws of electromagnetic induction, Maxwell's fourth equation - Simple problems, Modification of Maxwell's equations for time varying fields, Displacement current.

TEXT BOOKS:

1. Engineering electromagnetics by William H. Hayt & John. A. Buck, McGraw Hill Companies-7th Edition, 2012.
2. Electromagnetic fields, Sadiku, Oxford Publications-7thEdition.

REFERENCE BOOKS:

1. Engineering electromagnetics, J P Tewari, Khanna Publishers-2nd Edition, 2005.
2. Elements of electromagnetic fields, S. P. Seth, Dhanpat Rai & Co. (Pvt.) Ltd-2ndEdition.
3. Electromagnetic field theory, K. A. Gangadhar, P. M. Ramanathan, Khanna Publishers- 16th Edition.

ELECTRICAL MACHINES LAB - I

Department of Electrical and Electronics Engineering					II B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A223284	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Pre-requisites: Electrical Machines

Course Outcomes:

After the completion of Laboratory course, the student will be able to

CO1. Start and control the Different types of DC motors.
CO2. Assess the performance of different types of DC machines using different testing methods.
CO3. Identify different conditions required to be satisfied for self - excitation of DC Generators.
CO4. Separation losses of DC motor into different components.
CO5. Analyze the performance of coupled machines.

LIST OF EXPERIMENTS

Any 10 out of the following 12 experiments should be conducted:

1. Magnetization characteristics of a DC shunt generator.
2. Load test on DC shunt generator.
3. Load test on DC compound generator.
4. Load test on DC series generator.
5. Brake test on DC compound motor.
6. Hopkinson's test on DC Shunt machines.
7. Field's test on DC Series machines.
8. Separation of losses in DC shunts motor.

In addition to the above eight experiments at least any two of the following experiments are required to be conducted from the following list.

1. Retardation test on DC shunt motor.
2. Speed control of DC shunt motor.
3. Swinburne's test on DC shunt machine.
4. Brake Test on DC shunt Motor.

NETWORKS LABORATORY

Department of Electrical and Electronics Engineering					II B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A223285	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Course Outcomes:

After the completion of Laboratory course, the student will be able to

CO1. Obtain two port network parameters and applications
CO2. Observe the time response of various R, L and C circuits for different excitations.
CO3. Obtain the self and mutual inductance of coupled circuits
CO4. Examine the behavior of single phase and polyphase circuits
CO5. Outline the locus diagrams of Rl, RC circuits

LIST OF EXPERIMENTS

1. To draw the locus Diagrams of RL (R-Varying) and RC (R-Varying) Series Circuits.
2. Verification of Series and Parallel Resonance.
3. Determination of Time response of first order RL and RC circuit for periodic non – sinusoidal inputs
4. Determination of Two port network parameters – Z & Y parameters.
5. Determination of Two port network parameters – A, B, C, D parameters.
6. Determination of Co-efficient of Coupling and Separation of Self and Mutual inductance in Coupled Circuits.
7. Calculation of RMS, average values, form factor and peak factor of complex waveform.
8. Measurement of Active Power for Star and Delta connected balanced loads.
9. Measurement of Reactive Power for Star and Delta connected balanced loads.
10. Determination of Two port network parameters -Hybrid parameters.
11. To draw the locus Diagrams of RL (L-Varying) and RC (C-Varying) Series Circuits.
12. Determination of Time response of RLC circuit for periodic non – sinusoidal inputs

ELECTRICAL SIMULATION TOOLS LABORATORY

Department of Electrical and Electronics Engineering					II B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A223286	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech. II Year I Semester

Course Outcomes:

Upon the completion of laboratory course, the student will be able to

CO1. Correlate the data using plots.
CO2. Verify network theorems.
CO3. Observe transient response of series circuits.
CO4. Simulate rectifier circuits.
CO5. Analyze networks using network theorems.

LIST OF EXPERIMENTS

Any Ten of the following experiments should be conducted

Introduction to basic block sets of simulation platforms.

1. Basic matrix operations, Generation of standard test signals

2. Find loop currents using Mesh Analysis

3. Find nodal voltages and branch voltages using nodal voltages

4. Basic 2D plots of simple equation

5. Measurement of Voltage, Current and Power in DC circuits.

6. Verification of Thevenin's Theorem using suitable simulation tools.

7. Verification of Superposition Theorem using suitable simulation tools.

8. Analysis of series and parallel resonance circuits using suitable simulation tools

9. Obtaining the response of electrical network for standard test signals using suitable simulation tools.

10. Solving the linear and nonlinear differential equations

11. Verification of performance characteristics of PN junction diode and Zener diode using suitable simulation tools.

12. Analysis of half wave rectifier with and without filter.

PROFESSIONAL COMMUNICATION

Department of Electrical and Electronics Engineering				II B.Tech II Semester		
Course Code	Hours/Week		Credits	Marks		
A223012	L	T	P	C	CIE	SEE	Total
	2	0	0	1	40	60	100

B. Tech. II Year II Semester

Course Outcomes

CO1. Acquire enhanced personality
CO2. Demonstrate appropriate professional etiquette
CO3. Practice team building with strong communication skills
CO4. Develop problem solving skills and decision-making
CO5. Exhibit effective communication on digital platforms

Unit: I: Introduction to Soft Skills

Soft Skills for personal and professional development
Self Introduction in various situations
SWOC Analysis
Goal setting

Unit: II: Professional Etiquette

Etiquette-Mobile Etiquette- Netiquette
Non-Verbal Communication
Presentations – Individual & Team
Time Management

Unit: III: Team Essentials

Leadership Skills
Team Building
Negotiation Skills
Group Discussion-Functional Aspects

Unit: IV: Decision Making & Problem Solving

Logical Thinking
Decision Making
Problem Solving
Critical Thinking

Unit: V: Digital Communication

Role of Multimedia in Communication
E-Mail
Social Networking: Importance and Effects.
Communication in Corporate World

References Books:

1. Ashrif Rizvi, Effective Technical Communication, Tata Mac Graw Hill, 2018.
2. Barun, K Mitra, Personality Development and Soft Skills, Oxford University Press, 2nd Edition, 2017.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH II YEAR COURSE STRUCTURE
(Electrical and Electronics Engineering)

Semester - II

S. No.	Course Code	Course Title	L	T	P	Credits
1	A224209	Power System-I	3	0	0	3
2	A224210	Measurements and Instrumentation	3	0	0	3
3	A224211	Electrical Machines–II	3	0	0	3
4	A224409	Digital Electronics	2	0	0	2
5	A224212	Control Systems	3	0	0	3
6	A224288	Analog Electronic Circuits Laboratory	0	0	2	1
8	A224289	Measurements and Instrumentation Laboratory	0	0	2	1
9	A224290	Electrical Machines Laboratory-II	0	0	2	1
10	A2242P1	Real-time Research Project/ Field Based Project	0	0	4	2
11	A224013	Quantitative Methods and Logical Reasoning	2	0	0	1
		Total Credits	**16**	**0**	**10**	**20**

POWER SYSTEMS – I

Department of Electrical and Electronics Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A224209	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B. Tech. II Year II Semester

Course Outcomes:

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

- **CO1.** Understand the operation of conventional and renewable electrical power generating stations.
- **CO2.** Evaluate the power tariff methods and Economics associated with power generation.
- **CO3.** Analyze the operations of AIS.
- **CO4.** Analyze various types of DC Distribution systems
- **CO5.** Assess the performance of various AC Distribution Systems

UNIT-I:

GENERATION OF ELECTRIC POWER:

Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant and GasTurbine Plant.

Non-Conventional Sources (Elementary Treatment):

Solar Energy, Wind Energy, Fuel Cells, Ocean Energy, Tidal Energy, Wave Energy, Cogeneration,Energy conservation and storage.

UNIT-II:

ECONOMICS OF POWER GENERATION: Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants.

Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

UNIT-III:

SUBSTATIONS:

AIR INSULATED SUBSTATIONS (AIS): Indoor & Outdoor substations: Substations layout 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, main and transfer bus bar system with relevant diagrams.

UNIT-IV:

DC DISTRIBUTION: Classification of Distribution Systems. - Comparison of DC vs. AC and Under- Ground vs. Over- Head Distribution Systems. - Requirements and Design features of Distribution Systems. -Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

UNIT-V:

A.C. DISTRIBUTION: Introduction, AC distribution, Single phase, 3-phase, 3 phase 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in
A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

TEXT BOOKS:

1. C.L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", 2nd Edition,New AgeInternational, 2009.
2. V.K Mehta andRohit Mehta, "Principles of Power Systems", S. Chand & Company Ltd, NewDelhi, 2004.

REFERENCE BOOKS:

1. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power SystemEngineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
2. C.L. Wadhwa, "Electrical Power Systems", 5th Edition, New Age International, 2009.
3. M.V. Deshpande, "Elements of Electrical Power Station Design", 3rd Edition, Wheeler Pub.1998.

MEASUREMENTS AND INSTRUMENTATION

Department of Electrical and Electronics Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A224210	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B. Tech. II Year II Semester

Course Outcomes:

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

CO1. Understand all types of measuring instruments and error compensations.
CO2. Discuss the operation of DC Crompton potentiometer; compare the CT and PT with phasor diagram.
CO3. Describe the concepts of power and energy measurement by using wattmeter and energy meter.
CO4. Outline the concept of DC and AC bridges for the measurement of resistance, inductance & capacitance.
CO5. Analyze the concepts of transducers and cathode ray oscilloscopes.

UNIT - I

INTRODUCTION TO MEASURING INSTRUMENTS: Classification-deflection, control and damping torques- Ammeters and Voltmeters- PMMC and moving iron type instruments- expression for the deflecting torque and control torque- Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters, electrometer type and attracted disc type voltmeters.

UNIT - II

POTENTIOMETERS& INSTRUMENT TRANSFORMERS: Principle and operation of D.C. Crompton's potentiometer - standardization, Measurement of unknown resistance, current and voltage. A.C. Potentiometers: polar and coordinate types, standardization and applications. CT and PT- Ratio and Phase angle errors (of CT only).

UNIT - III

MEASUREMENT OF POWER & ENERGY: Single phase dynamometer, LPF and UPF watt meters, Double element and three element dynamometer watt meter- expression for deflecting and control torques, extension of range of wattmeter using instrument transformers. Measurement of reactive power. Single phase Induction type energy meter- driving and braking torques-errors and compensations, testing by phantom loading using RSS meter. Three phase energy meter- Maximum demand meters.

UNIT - IV

D.C BRIDGES & A.C BRIDGES: Methods of measuring low, medium and high resistances, sensitivity of wheat- stone Bridge, Carey foster's Bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance - loss of charge method. Measurement of Inductance and Q Factor - Maxwell's Bridge, Hay's bridge, Anderson's bridge and Owen's bridge. Measurement of capacitance and loss angle – Desauty's Bridge and Schering Bridge. Wien's Bridge.

UNIT - V

TRANSDUCERS & OSCILLOSCOPES: TRANSDUCERS: Definition of transducer, classification of transducers, advantages of electrical transducers, characteristics and choice of transducers. Principle of operation of LVDT and capacitor transducers, LVDT Applications, Strain guage and its principle of operation, guage factor, Thermistors, Thermo-couples, Piezo-electric transducers, photo-voltaic, photo-conductive cells and photo-diodes.

OSCILLOSCOPES - Cathode Ray Oscilloscope (CRO)- Cathode Ray tube, time base generator, horizontal and vertical amplifiers and Lissajous Patterns.

TEXT BOOKS:

1. A course in electrical and electronic measurements and instrumentation by A. K. Sawhney, Puneet Sawhney, Dhanpat Rai & Co.
2. Electrical & electronic measurements and instrumentation, R. K. Rajput, S. Chand & Company Ltd.

REFERENCE BOOKS:

1. Electrical measurements and measuring instruments, Golding E.W, Widdis F.C, Publisher: AH Wheeler &Company.
2. Electrical and electronic measurements, G.K. Banerjee, PHI Learning Pvt. Ltd.
3. Electrical Measurements and Measuring Instruments, N. V. Suryanarayana, Tata McGraw Hill.

ELECTRICAL MACHINES – II

Department of Electrical and Electronics Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A224211	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B. Tech. II Year II Semester

Course Outcomes:

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

CO1. Understand the concepts of poly phase induction machines.
CO2. Examine the operation of induction motors.
CO3. Analyze performance characteristics of synchronous machines.
CO4. Evaluate the performance characteristics of Synchronous Generators
CO5. Assess the construction and operation of synchronous motors and special machines

UNIT – I

Poly-Phase Induction Machines: Constructional details of cage and wound rotor machines-production of a rotating magnetic field - principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current and Power factor at standstill and during operation. Induction generator-principle of operation(elementary treatment only).

UNIT – II

Characteristics of Induction Motor: Rotor power input, rotor copper loss and mechanical power developed. Torque equation- expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram-crawling and cogging - No-load Test and Blocked rotor test –Predetermination of performance-Methods of starting and starting current and Torque calculations.

Speed Control Methods: Change of voltage, change of frequency, voltage/frequency, and injection of an EMF into rotor circuit (qualitative treatment only)

UNIT – III

Synchronous Machines: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings –distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics.

UNIT – IV

Regulation and Parallel operation of Synchronous Machine: Regulation: Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction concept – experimental determination of X_d and X_q (Slip test).

Parallel Operation of Synchronous Machines: Synchronizing alternators with infinite bus bars –synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input.

UNIT – V

Synchronous Motors and Special Machines: Synchronous Motors: Theory of operation – Methods of starting- phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed - hunting and its suppression –synchronous induction motor.

Special Machines: Principles of operation of Reluctance Motors, Permanent magnet Brushless DC Motors.

TEXT BOOKS:

1. Theory and Performance of Electrical Machines, J.B. Gupta, S.K.Kataria & Sons , 2013.
2. Electrical Machines, R.K.Rajput, Laxmi Publications (P) Ltd, 2004.

REFERENCE BOOKS:

1. Electrical Machinery, P. S. Bimbhra, Khanna Publishers, 2011.
2. Electric Machines, I. J. Nagrath and D. P. Kothari, McGraw Hill Education, 2010.
3. Alternating current machines, A. S. Langsdorf, McGraw Hill Education, 1984.

DIGITAL ELECTRONICS

Department of Electrical and Electronics Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A224409	L	T	P	C	CIE	SEE	Total
	2	0	0	2	40	60	100

B. Tech. II Year II Semester

Course Outcomes:

At the end of the course, the student should be able to

CO1. Demonstrate the basic theorems of Boolean algebra, logic gates, combinational and sequential circuits and memories.
CO2. Analyze the combinational and sequential circuits and memories.
CO3. Design of logic circuits
CO4. Realization of gates using different logic families.
CO5. Explain the design and operation of different semiconductor memories

UNIT I

NUMBER SYSTEM AND MINIMIZATION TECHNIQUES:

Number System: Review of number system and base conversion, complements, signed binary numbers, floating point number representation, Error detection (parity detection only).

Minimization techniques: Boolean Algebra**,** postulates ,basic logic gates, Canonical and Standard Form, NAND and NOR implementation, Minimization of switching function using theorem, The Karnaugh Map Method-Up to Five Variable Maps, Tabular Method.

UNIT II

COMBINATIONAL CIRCUITS:

Adders & Subtractor, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparators, Multiplexers, De-multiplexers, Decoders, Encoders and Code converters, Hazards and Hazard Free Relations.

UNIT III

SEQUENTIAL CIRCUITS-I:

Basic Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip Flops: SR, JK, Race Around Condition in JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop, Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.

UNIT IV

SEQUENTIAL CIRCUITS-II:

Synchronous – Asynchronous – Comparison, Design of Single mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register, MOD Counters. Finite state machine - capabilities and limitations, Mealy and Moore models.

UNIT V

LOGIC FAMILIES AND SEMICONDUCTOR MEMORIES:

Logic Families: DCTL, RTL, DTL, TTL and CML Logic –gate realization - Comparison,

Semiconductor Memories: Introduction to ROM, PAL, PLA, CPLD, FPGA.

FPGA Applications: Server Applications, control of motors (elementary treatment only)

TEXT BOOKS:

1. Switching and finite automata theory, Zvi Kohavi & Niraj K. Jha, Cambridge-3rd Edition.
2. Modern digital electronics – R. P. Jain, Tata McGraw-Hill-3rd Edition.

REFERENCE BOOKS:

1. Digital design, Morris Mano, PHI-4thEdition.
2. Introduction to switching theory and logic design, Fredriac J. Hill, Gerald R. Peterson, John Wiley & Sons Inc-3rdEdition.
3. Fundamentals of logic design- Charles H. Roth, Cengage Learning-5thEdition.

CONTROL SYSTEMS

Department of Electrical and Electronics Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A224212	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B. Tech. II Year II Semester

Course Outcomes

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

CO1. Understand the fundamentals of classical and modern control systems.
CO2. Apply modelling concepts for electrical and mechanical systems.
CO3. Analyse time and frequency responses of first and second-order systems.
CO4. Assess stability of control systems.
CO5. Analyze stability using state space

UNIT – I

Introduction: Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback.
Mathematical models – Differential equations, Impulse Response and transfer functions - Translation and Rotational mechanical systems

UNIT II

Transfer Function Representation: Transfer Function of DC Servo motor - AC Servo motor- Synchro Transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT –III

Time Response and Stability Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.
The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.

The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT – IV

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the

Bode Diagram-Phase margin and Gain margin Stability Analysis from Bode Plots, Nyquist Plots-Stability Analysis.

UNIT – V

Classical Control Design Techniques:
Introduction to Compensation techniques, PID Controllers.

State Space Analysis of Continuous Systems:
Concepts of state, state variables and state model, derivation of state models - Solving the Time invariant state Equations - State Transition Matrix and its Properties, Concepts of Controllability and Observability.

TEXT BOOKS :

1. Control Systems Engineering – I.J.Nagrath and M.Gopal, New Age International (P) Limited, Publishers, 2nd edition, 2009.
2. Automatic Control Systems - B. C. Kuo, John wiley and sons. 8th edition, 2003.
3. Control Systems – N.C.Jagan, BS Publications

REFERENCE BOOKS:

1. Modern Control Engineering –Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd Edition, 1998.
2. Control Systems-N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engg. -– John wiley, NISE, 4rd edition, 2007.
4. Control Systems – Nagoorkani, 1998.

ANALOG ELECTRONIC CIRCUITS LABORATORY

Department of Electrical and Electronics Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A224288	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech. II Year II Semester

Course Outcomes:

Upon the completion of Laboratory course, the student will be able to

CO1. Identify and use the basic components and instruments in electronics laboratory
CO2. Outline the characteristics of different semiconductor devices.
CO3. Interpret the ripple factor, regulations of rectifiers.
CO4. Sketch the frequency response of small signal amplifiers.
CO5. Understand the concepts of SCR & UJT and observe its characteristics.

LIST OF EXPERIMENTS

PART-A: (Only for Viva-voce Examination) Electronic Workshop Practice (In 3 Lab Sessions):

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's.
2. Identification, Specifications and Testing of Active Devices, Diodes, BJT's, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR,UJT.
3. Study and operation of
   a. Multimeters (Analog and Digital).
   b. Function Generator.
   c. Regulated Power Supplies.
   d. CRO.

PART B: Minimum of 10 experiments of the following should be conducted

1. Forward & Reverse Bias Characteristics of PN Junction Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Half Wave Rectifier with & without filters.
4. Full Wave Rectifier with & without filters.
5. Input & Output Characteristics of Transistor in CB Configuration.
6. Input & Output Characteristics of Transistor in CE Configuration.
7. FET characteristics.
8. Lissajous patterns using CRO.
9. Frequency Response of CC Amplifier.
10. Frequency Response of CE Amplifier.
11. Frequency Response of Common Source FET amplifier.

12. SCR Characteristics.
13. UJT Characteristics.
14. Clippers
15. Clampers

MEASUREMENTS AND INSTRUMENTATION LABORATORY

Department of Electrical and Electronics Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A224288	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech. II Year II Semester

Course Outcomes:

Upon the completion of Laboratory course, the student will be able to

CO1. Calibrate voltmeters, ammeters and single phase energy meter.
CO2. Design the scale of PMMC voltmeter, LPF wattmeter, LVDT and resistance strain gauge.
CO3. Calculate resistance, inductance and capacitance using bridges.
CO4. Compute 3-Φ reactive power.
CO5. Test single phase energy meter and dielectric strength of oil of transformers.

LIST OF EXPERIMENTS

Any ten of the following experiments are required to be conducted

1. Calibration and Testing of single phase energy Meter.
2. Calibration of dynamometer type power factor meter.
3. Crompton D.C. Potentiometer - Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge - Measurement of resistance - Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 Phase reactive power with single-phase wattmeter.
8. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
9. LVDT and capacitance pickup - characteristics and Calibration.
10. Resistance strain gauge - strain measurements and Calibration.
11. Transformer turns ratio measurement using A.C. Bridge.
12. Measurement of ratio error and phase angle of given C.T. by comparison.

ELECTRICAL MACHINES LABORATORY - II

Department of Electrical and Electronics Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A224289	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech. II Year II Semester

Course Outcomes:

Upon the completion of Laboratory course, the student will be able to

CO1. Understand the basic working principle of a transformer; obtain the equivalent circuit parameters, estimate efficiency & regulation at various loads of 1-Φ transformers.
CO2. Examine load sharing of transformers & conversion of 3- Φ to 2- Φ supply.
CO3. Determine the equivalent circuit parameters of a single phase induction motor; determine the performance characteristics and efficiency by direct and indirect methods of three phase induction motor.
CO4. Analyze the regulation of an alternator by various methods at different power factors.
CO5. Assess synchronous motor performance curves at various power factors and field currents.

LIST OF EXPERIMENTS

Any Ten of the following experiments are required to be conducted.

1. Sumpner's test on a pair of single phase transformer.
2. Separation of core losses of a single phase transformer.
3. Scott connection of transformer and Parallel operation of single phase transformer.
4. No-load & Blocked rotor tests on three phase induction motor.
5. Regulation of a three – phase alternate by synchronous impedance M.M.F methods.
6. V and inverted V curves of a three – phase synchronous motor.
7. Equivalent circuit of a single phase induction motor.
8. Determination of Xd and Xq of a salient pole synchronous machine.

In addition to the above eight experiments at least any two of the following experiments are required to be conducted from the following list.

9. Regulation of three phase alternator by Z.P.F. and A.S.A methods.
10. Determination of sequence impedances of a three-phase alternator.
11. Determination of sequence impedances of a three-phase transformer.
12. Speed control of three phase slip ring Induction Motor.

QUANTITATIVE METHODS AND LOGICAL REASONING

Department of Electrical and Electronics Engineering					II B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A224290	L	T	P	C	CIE	SEE	Total
	2	0	0	1	40	60	100

B. Tech. II Year II Semester

Course Outcomes :

CO1. To perform well in various competitive exams and placement drives.

CO2. To solve basic and complex mathematical problems in short time.

CO3. To become strong in Quantitative Aptitude and Reasoning which can be applied for GRE, GATE, GMAT or CAT exam also.

CO4. To develop problem solving skills and analytical abilities, which play a great role in corporate and industry set up.

Unit – I :

Number System: Speed Maths, Numbers, Factors, Prime & Co Primes, LCM & HCF, Divisibility Rules, Finding Unit Place Digit and Last Two Digits of an Expression

Ratio, Proportion and Variations: Definition of Ratio, Ratio of Proportion, Comparison of Ratios, Compound ratio, Direct and Indirect Proportion

Percentages: Converting Fractions and Decimal into Percentages, Successive Percentage, Populations, Expenditure and Savings

Profit and loss: Relation between Cost Price and Selling Price, Discount and Marked Price, Gain or Loss Percentages on Selling Price

Simple and Compound Interest: Problems on Interest (**I**), Amount (**A**), Principal (**P**) and Rate of Interest (**R**) difference between the Simple Interest and Compound Interest for 2 and 3 years.

Unit – II :

Partnership: Relation between Partners, Period of Investment and Shares

Averages, Ages and Allegation : Average of Different Groups, Change in Averages by Adding, Deleting and Replacement of Objects, Problems on ages, Allegation Rule, Mean Value of the Mixture, Replacement of Equal Amount of Quantity.

Time and Work: Men and Days, Work and Wages, Pipes and Cisterns, Hours and Work, Alternate Days Concept,

Time and Distance: Difference between the Average and Relative Speeds, Reaching the Destination Late and Early, Stoppage Time Per Hour, Time and Distance between Two Moving Bodies : Train Crossing Man - same and opposite directions, Speed of Boat and Stream,

Unit – III :

Progressions and Quadratic Equations : Arithmetic, Geometric and Harmonic Progressions, Arithmetic Mean, Geometric Mean and Harmonic Mean and their Relations. General form of Quadratic Equation, Finding the Roots of Quadratic Equation, Nature of the Roots.

Permutation and Combination: Fundamental Rules, Problems on Permutations & combinations.

Probability : Definition of probability, Notations and Formulae, Problems on Probability.

Data Interpretation and Data Sufficiency: Tabular and Pie-charts, Bar and Line Graphs, Introduction to Data Sufficiency, Problems on Data Sufficiency.

Unit – IV :

Deductions: Statements and conclusions using Venn diagram and Syllogism Method

Series completion: Number series, Alphabet series, Letter Series.

Coding and Decoding: Letter coding, Number coding, Number to letter coding, Matrix Coding, Substitution, Mixed Letter Coding, Mixed Number Coding, Deciphering Individual Letter Codes by Analysis.

Analytical Reasoning Puzzles:
Problems on Linear, Double line-up and Circular Aarrangements, Selections and Comparisons.

Blood Relations:
Defining the various Relations among the Members of a Family, Solving Blood Relation Puzzles by using Symbols and Notations**.** Problems on Coded Relations.

Unit – V :

Direction sense Test: Sort of directions in puzzles distance between two points, problems on shadows, Application of triangular triplets.

Clocks: Relation between Minute-Hour Hands, Angle vs Time, Exceptional Cases in Clocks

Calendars: Definition of a Leap Year, Finding the Odd days, Finding the Day of any Random Calendar Date, repetition of Calendar Years.

Cubes and Dices: Finding the Minimum and Maximum Number of Identical Pieces and Cuts, Painting of Cubes and cuts, Problems on Dice.

Venn Diagrams: Circular Representation of given words, Geometrical Representation of Certain class, Set theory based Problems.

Text Books:

1. Verbal Reasoning, GL Barrons, Pinterest, Latest Edition 2019
2. A Modern Approach to Logical Reasoning & Quantitative Aptitude, R S Agarwal, S. Chand, Publications, Revised edition, 2019

Reference Books:

1. Quantitative Aptitude, G.L Barrons, Pinrest 2019
2. Quantitative Aptitude, Abhijit Guha, Mc Graw Hills, Edition 2019
3. Quantitative Aptitude, U. Mohan Rao SCITECH

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH III YEAR COURSE STRUCTURE
(Electrical and Electronics Engineering)
Semester - I

S.No.	Course Code	Course Title	L	T	P	Credits
1	A225213	Power Electronics	3	1	0	4
2	A225214	Power System-II	3	1	0	4
3	A225215	Microprocessors & Microcontrollers	3	0	0	3
4	A225216 A225217 A225218	IoT Applications in Electrical Engineering Electrical Energy Conservation and Auditing Cyber-Physical Systems	3	0	0	3
5	A225219 A225220	Sustainable Energy Power Applications of Electricity	3	0	0	3
6	A225487	Microprocessors & Microcontrollers Laboratory	0	0	2	1
7	A225291	Control Systems Laboratory	0	0	2	1
8	A225087	Advanced English Communication Skills Laboratory	0	0	2	1
9	A225016	Environmental Science	2	0	0	0
		Total Credits	**17**	**2**	**6**	**20**

POWER ELECTRONICS

Department of Electrical and Electronics Engineering					III B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A225213	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B. Tech. III Year I Semester

Course Outcomes:

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

CO1. Understand about various power electronic devices and their commutation procedure.
CO2. Discuss the operation of various single phase-controlled converters.
CO3. Examine operation of various three phase-controlled converters and AC voltage controllers.
CO4. Identify the operation of DC-DC converters.
CO5. Analyze the operation of DC-AC converters.

UNIT - I

POWER SEMI CONDUCTOR DEVICES & COMMUNICATION CIRCUITS:

THYRISTORS: Silicon Controlled Rectifiers (SCR's), BJT, Power MOSFET, Power IGBT, their characteristics and other thyristors. Basic theory of operation of SCR, Static characteristics, Turn on and turn off methods. Dynamic characteristics of SCR - Turn on and Turn off times -Salient points. Two transistor analogy. UJT firing circuit, Series and parallel connections of SCR's, Snubber circuit details – Specifications .Ratings of SCR's, BJT and IGBT - Line Commutation and Forced Commutation circuits. Numerical problems

UNIT - II

AC-DC CONVERTERS (1-PHASE CONTROLLED RECTIFIERS): Phase control techniques, Single phase Line commutated converters, Midpoint and Bridge connections, half controlled converters with R, RL and RLE loads. Derivation of average load voltage and current-Active and Reactive power inputs to the converters without and with Freewheeling Diode Numerical problems. Fully controlled converters, Midpoint and Bridge connections with Resistive, RL loads and RLE load Derivation of average load voltage and current Line commutated inverters -Active and Reactive power inputs to the converters without and with Freewheeling Diode, Effect of source inductance- Derivation of load voltage and current. Numerical problems.

UNIT - III

AC-DC CONVERTERS (3-PHASE CONTROLLED RECTIFIERS):

THREE PHASE CONVERTERS: Three pulse and six pulse converters, Midpoint and bridge connections- average load voltage With R and RL loads, effect of Source inductance. Dual converters (both single phase and three phase) Waveforms. Numerical Problems.

AC-AC CONVERTERS (AC VOLTAGE CONTROLLERS) & FREQUENCYCHANGERS (CYCLO-CONVERTERS):

AC VOLTAGE CONTROLLERS: Single phase two SCR's in anti-parallel with R and RL loads. Modes of operation of Triac, Triac with R and RL loads - Derivation of RMS load voltage, current and power factor wave forms. Firing circuits -Numerical problems – **CYCLOCONVERTERS:** Single phase mid-point cyclo-converters with Resistive and inductive loads. (Principle of operation only) Bridge configuration of single phase cyclo-converter (Principle of operation only) Waveforms.

UNIT IV

DC-DC CONVERTERS (CHOPPERS): CHOPPERS: Time ratio control and Current limit control strategies. Step down choppers- Derivation of load voltage and currents with R, RL and RLE loads. Step up Chopper – load voltage expression. Jones chopper, AC Chopper, Problems. Switched Mode Regulator - SMPS (Basic Principle of Operation).

UNIT V

DC-AC CONVERTERS (INVERTERS): INVERTERS: Single phase inverter, basic series inverter, parallel inverter - operation and waveforms .Three phase inverters (180, 120 degrees conduction modes of operation). Voltage control techniques for inverters, Pulse width modulation techniques. Numerical problems.

TEXT BOOKS:

1. Power electronics, Dr. P. S. Bimbhra, Khanna Publishers, 3rd edition.
2. Power electronics, circuits, devices and applications, M. H. Rashid, Prentice Hall of India, 4th edition.

REFERENCE BOOKS:

1. Power electronics devices, circuits and industrial applications, V. R. Moorthi, Oxford University Press.
2. Power electronics, M. D. Singh &K. B. Kanchandhani, Tata McGraw - Hill Publishing Company, 1998,
3. Power electronics, Vedam Subramanyam, New Age International (P) Limited Publishers, 2nd edition.

POWER SYSTEMS – II

Department of Electrical and Electronics Engineering					III B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A225214	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B. Tech. III Year I Semester

Course Outcomes:

After learning the contents of this paper the student must be able to

CO1. Understand the concept of over head transmission systems.
CO2. Analyze performance of transmission lines
CO3. Assess the need of voltage control and compensation in power systems
CO4. Prioritize per unit representation of power systems
CO5. Analyze various faults

UNIT - I:

OVER HEAD TRANSMISSION LINES: Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors- transposition, bundled conductors, and effect of earth on capacitance,skin and proximity effects.

OVERHEAD LINE INSULATORS: Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators, Sag and tension calculations.

UNIT- II:

PERFORMANCE OF TRANSMISSION LINES: Representation of lines, short transmission lines, medium length lines, nominal T and PI- representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C, D constants, Ferranti Effect.

Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona, interference between power and Communication lines.

UNIT-III:

VOLTAGE CONTROL & POWER FACTOR IMPROVEMENT: Introduction – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers, power factor improvement methods.

COMPENSATION IN POWER SYSTEMS: Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

UNIT-IV:

PER UNIT REPRESENTATION OF POWER SYSTEMS: The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages of per unitsystem.

TRAVELLING WAVES ON TRANSMISSION LINES: Production of travelling waves, 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, capacitor connection at a T-junction, Attenuation of travelling waves.

UNIT-V:

SYMMETRICAL COMPONENTS AND FAULT CALCULATIONS: Significance of positive, negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedances and sequence networks, fault calculations, sequence network equations, singleline to ground fault, line to line fault, double line to ground fault, three phase fault, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

TEXT BOOKS:

1. C.L. Wadhwa, "Electrical Power Systems", New Age International Pub. Co, Third Edition, 2001.
2. D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", Tata Mc Graw Hill Pub. Co.,New Delhi, Fourth edition, 2011.

REFERENCE BOOKS:

1. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power SystemEngineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
2. John J. Grainger & W.D. Stevenson, "Power System Analysis", Mc Graw Hill International,1994.
3. Hadi Scadat, "Power System Analysis", Tata Mc Graw Hill Pub. Co. 2002.
4. W.D. Stevenson, "Elements of Power system Analysis", McGraw Hill International StudentEdition.

MICROPROCESSORS AND MICROCONTROLLERS

Department of Electrical and Electronics Engineering					III B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A225215	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B. Tech. III Year I Semester

Course Outcomes

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

CO1. Illustrate the internal architecture of 8086 and 8051
CO2. Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller.
CO3. Explain the use of interrupts with suitable examples.
CO4. Demonstrate the interfacing of various peripheral devices with the microprocessor 8086.
CO5. Design electrical circuitry to the Microcontroller I/O ports in order to interface the controller to external devices.

UNIT-I

8086 Microprocessor: Introduction to 8085 microprocessor- 8086 architecture- Functional Diagram- Register Organization- Memory segmentation- Memory addresses- physical memory organization- Signal descriptions of 8086- common function signals- Minimum and Maximum mode operation- Timing diagrams- Interrupt structure.

UNIT-II

Assembly Language Programming using 8086: Instruction formats- addressing modes- instruction set- assembler directives-procedures-macros- Simple programs.

UNIT-III

Interfacing with 8086 Microprocessor: 8255 Programmable Peripheral Interface-Various Modes of Operation-Interfacing Keyboard- Display-Stepper motor- ADC-DAC-8259 Programmable Interrupt Controller -8257DMA controller.

UNIT-IV

Communication Interface: Serial communication standards- serial data transfer schemes- 8251 USART architecture and Interfacing- RS-232-TTL to RS 232C and RS232C to TTL conversion. Simple programs on serial data transfer-IEEE-488

UNIT-V

Introduction to Microcontrollers: Overview of 8051 microcontroller- Architecture- I/O ports and Memory organization- addressing modes and instruction set of 8051- Simple programs

Introduction to ARM Processor: ARM Processor fundamentals, ARM Architecture.

TEXT BOOKS

1. Advanced Microprocessors and Peripherals, A. K. Ray and K.M. Bhurchandani, TMH- 2nd Edition 2006.
2. Microprocessor and Interfacing, DV Hall, , Mc Graw Hill, 2006

REFERENCES

1. The 8051Microcontrollers- Architecture and Programming and Applications, K.Uma Rao & Andhe Pallavi, Pearson- 2009.
2. The 8051 Micro controller, Kenneth. J. Ayala, Cengage Learning, 2004.
3. Microprocessor Architecture, Programming and Applications with the 8085 , Ramesh Gaonkar, Penram International Publishing; 6th edition (1 October 2013) 2013

MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

Department of Electrical and Electronics Engineering				III B.Tech I Semester		
Course Code	Hours/Week		Credits	Marks		
A225487	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech. III Year I Semester

Course Outcomes:

Upon the completion of Laboratory course, the student will be able to

CO1. Perform arithmetic operations on 8086 microprocessor
CO2. Illustrate array sorting, searching and string manipulations using 8086 microprocessor.
CO3. Examine various operations using simulation software.
CO4. Perform various operations on 8051 microcontroller
CO5. Design and implement electrical circuitry to the Microcontroller I/O ports in order to interface the controller to external devices.

LIST OF EXPERIMENTS

8086 MICROPROCESSOR KITS AND/OR ASSEMBLER

1. Arithmetic Operations (addition, subtraction, multiplication and division)
2. Addition of two BCD numbers.
3. Ascending order/Descending order of an array of numbers.
4. Finding Largest/Smallest numbers in an array of numbers.
5. Generation of Fibonacci series.
6. Hexadecimal to Decimal conversions
7. ASCII to Decimal conversion
8. Program for sorting an array for 8086.
9. Program for searching for a number or character in a string for 8086.
10. Program for string manipulations for 8086.

8051 MICROCONTROLLER:

1. Arithmetic Operations (addition, subtraction, multiplication and division)
2. Addition of two BCD numbers.
3. Ascending order/Descending order of an array of numbers.
4. Finding Largest/Smallest numbers in an array of numbers.
5. Generation of Fibonacci series.
6. Masking of Bits.
7. Hexadecimal to Decimal conversion.

INTERFACING WITH 8086 MICROPROCESSOR:

1. Stepper motor interfacing to 8086.
2. Elevator simulator interfacing to 8086.
3. seven- segment display interfacing to 8086.
4. Interfacing ADC and DAC to 8086.
5. Digit Key – interfacing to 8086

CONTROL SYSTEMS LABORATORY

Department of Electrical and Electronics Engineering					III B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A225291	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech. III Year I Semester

Course Outcomes:

Upon the completion of Laboratory course, the student will be able to

CO1. Examine the time response of second order systems, Synchros, and truth tables verification by PLC.
CO2. Design of AC servomotor and DC servomotor to find out their transfer function practically.
CO3. Design of DC motor, DC generator, and finding out their transfer function practically.
CO4. Analyze magnetic amplifier characteristics.
CO5. Explain stability analysis through bode, Nyquist and root locus plots using Simulation Software.

LIST OF EXPERIMENTS

Any Ten of the following experiments are to be conducted

1. Time response of Second order system.
2. Characteristics of Synchros.
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple. Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servomotor.
5. Transfer function of DC motor.
6. Transfer function of DC Shunt generator.
7. Characteristics of magnetic amplifiers.
8. Characteristics of AC servomotor.
9. Simulation of Op-Amp based Integrator and Differential circuits.
10. Linear system analysis (Time domain analysis, Error analysis).
11. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using simulation software.
12. State space model for classical transfer function– Verification using simulation software.

ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

Department of Electrical and Electronics Engineering				III B.Tech I Semester		
Course Code	Hours/Week		Credits	Marks		
A225087	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech. III Year I Semester

Course Objectives:

- Improve the students' fluency in English with a focus on vocabulary
- Enable them to listen to English spoken at normal conversational speed by educated English speakers
- Respond appropriately in different socio-cultural and professional contexts
- Communicate their ideas relevantly and coherently in writing
- Prepare the students for placements

Course Outcomes:

CO1. At the end of the course a student is expected to:
CO2. Enhance reading and active listening techniques for a faster and better comprehension.
CO3. Exhibit strong writing skills to exhibit ideas effectively in social and professional situations.
CO4. Demonstrate effective presentation skills.
CO5. Develop critical thinking, problem-solving, decision-making and communication skills.
CO6. Display confidence during job interviews.

SYLLABUS

1. Activities on Listening and Reading Comprehension: Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading– Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub- skills of reading –Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning-Critical Reading— Reading Comprehension–Exercises for Practice.

2. Activities on Writing Skills: Vocabulary for Competitive Examinations – Planning for Writing – Improving Writing Skills-Structure and presentation of different types of writing–Free Writing and Structured Writing- Letter Writing –Writing a Letter of Application –Resume vs. Curriculum Vitae–Writing a Résumé–Styles of Résumé-e-Correspondence–Emails–Blog Writing- (N)etiquette– Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.

3. Activities on Presentation Skills - Starting a conversation – responding appropriately and relevantly – using the right language and body language–Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk–Oral presentations (individual land group)

through JAM sessions-PPTs–Importance of Presentation Skills– Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation.

4. Activities on Group Discussion (GD): Types of GD and GD as a part of a Selection Procedure- Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas– Do's and Don'ts-GD Strategies – Exercises for Practice.

5. Interview Skills: Concept and Process - Interview Preparation Techniques - Types of Interview Questions–Pre-interview Planning, Opening Strategies, Answering Strategies-Interview through Tele-conference & Video-conference - Mock Interviews.

Minimum Requirement:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- One PC with latest configuration for the teacher
- T.V, a digital stereo & Camcorder
- Headphones of High quality

Suggested Software:

1. TOEFL&GRE (BARRONS, USA, Cracking GRE by CLIFFS)
2. Oxford Advanced Learner's Dictionary,10 Edition
3. Cambridge Advanced Learner's Dictionary

TEXT BOOKS

1. Rizvi, M. Ashraf (2018). Effective Technical Communication. (2 ed.).McGraw Hill Education (India) Pvt. Ltd.

2. Bailey, Stephen. (2018). Academic Writing: A Handbook for International Students. (5 Edition). Routledge.

REFERENCES BOOKS:

1. Raman, Meenakshi & Sharma, Sangeeta. (2022).Technical Communication, Principles and Practice. (4th Edition) Oxford University Press.

2. Anderson, Paul V (2007).Technical Communication. Cengage Learning Pvt.Ltd. New

ENVIRONMENTAL SCIENCES

Department of Electrical and Electronics Engineering					III B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A225016	L	T	P	C	CIE	SEE	Total
	2	0	0	0	40	60	100

B. Tech. III Year I Semester

Course Outcomes

CO1. Define and explain the structure and functions of ecosystem, value of biodiversity, threats and conservation of biodiversity.
CO2. Explain the limitations of the resources and impacts of over utilization of all natural resources.
CO3. Explain the sources and effects of environmental pollutions and list the available techniques to control the pollution.
CO4. Explain the global environmental issues like climate change, ozone hole and can explain the scope of EIA, Environmental Management Plan, environmental audit and list the EIA methods.
CO5. Mention the salient features of environmental acts and rules, define the sustainable goals along with measures required for the sustainability.

UNIT I:

Ecosystem: Definition, Scope and Importance of ecosystem, Structure and Functions of ecosystem: Food chains, Food Web and Ecological Pyramids, Flow of energy; Bio-magnification.
Biodiversity and Biotic Resources: Introduction, Definition, levels of Biodiversity, Value of biodiversity, Hot spots of biodiversity, Threats to biodiversity, conservation of biodiversity: In-Situ and Ex-situ conservation.

UNIT II:

Natural Resources: Classification of Resources, **Water resources**: use and over utilization of surface and ground water, Dams: benefits and problems, Rain water harvesting; **Energy resources**: growing energy needs, Renewable and Non Renewable Energy resources. **Land resources**: land degradation – Landslide and Soil Erosion; **Forest Resources –** Uses and Exploitation.

UNIT III:

Environmental Pollution And Control: Types of Pollution, Sources, Effects and Control measures of Air Pollution ,Water Pollution ,Soil Pollution and Noise Pollution.

UNIT IV:

Global Environmental Problems and Global Efforts: Green house effect, Global Warming, climate change and their impacts on human environment; Ozone depletion and Ozone depleting substances (ODS); Aid Rains.
Environmental Impact Assessment (EIA): Scope of EIA and EIA methods, scope of Environmental audit and Environmental Management Plan.

UNIT V:

Environmental Policy, Legislation, Rules And Regulations: Salient features of Environmental Protection act, Air (Prevention and Control of pollution) Act- 1981, Water (Prevention and Control of pollution) Act-1974, Forest Conservation Act, Municipal solid waste, Hazardous waste, E-waste, Bio-medical waste, Radioactive waste Rules.

Towards Sustainable Future: Concept of Sustainable Development, Sustainable goals defined by UN, Threats to Sustainability, Environmental Education, Role of IT in Environment, Smart Cities, Concept of Green Building, Low Carbon Lifestyle, Life cycle assessment and Ecological Foot Print.

TEXT BOOKS:

1. Text Book of Environmental Studies by Anubha Kaushik (4th Edition), New age International Publishers.
2. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

REFERENCE BOOKS:

1. Textbook of Environmental Science and Technology by M. Anji Reddy,2007.
2. Text Book of Environmental Studies by Anubha Kaushik (3rdEdition), New age International Publishers.
3. Environmental Science : Towards a Sustainable Future by Richard T. Wright,2008 PHL Learning Private Ltd, New Delhi.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH III YEAR COURSE STRUCTURE
(Electrical and Electronics Engineering)

Semester-II

S.No	Course Code	Course Title	L	T	P	Credits
1	A226018	Business Economics and Financial Analysis	3	0	0	3
2	A226223 A226224 A226225	AI Techniques in Electrical Engineering Modern Power Electronics Wind and Solar Energy systems	3	0	0	3
3	A226221	Power Semiconductor Drives	3	0	0	3
4	A226222	Power System Protection	3	0	0	3
5	A226292	Energy Conservation and Management Industrial Electrical Systems	3	0	0	3
6	A226293	Power Electronics Laboratory	0	0	2	1
7	A226294	Simulation of Power Converters Lab	0	0	2	1
8	A2262P1	Power System Laboratory	0	0	2	1
9	A226292	Industry Oriented Mini Project / Internship	0	0	4	2
10	A226019	Gender Sensitization	2	0	0	0
		Total Credits	**17**	**0**	**10**	**20**

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

Department of Electrical and Electronics Engineering				III B.Tech II Semester		
Course Code	Hours/Week		Credits	Marks		
A226018	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B. Tech. III Year II Semester

Course Outcomes:

CO1. The students will be able to
CO2. Understand the nature and scope of business economics.
CO3. Differentiate the various forms of Business organizations.
CO4. Identify the impact of economic variables on the Business firms
CO5. Analyze the Demand, Supply, Production, Cost, Market Structure, Pricing aspects
CO6. Analyze, compare and interpret the Financial Statements of a Company using ratios.

UNIT – I:

Introduction to Business and Economics: Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II:

Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT- III:

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale.

Cost analysis: Types of Costs. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis

UNIT – IV:

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, and Preparation of Final Accounts.

UNIT – V:

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems)

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.

REFERENCES:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N. Maheshwari, Sunil.KMaheshwari, Sharad.KMaheshwari, Financial Accounting, 5e, Vikas Publications, 2013.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

POWER SEMICONDUCTOR DRIVES

Department of Electrical and Electronics Engineering					III B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A226221	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B. Tech. III Year II Semester

Course Outcomes:

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

CO1. Understand the concepts of the dynamics of electric drives and speed control of different types of DC drives.
CO2. Examine four quadrant operation to control speed of DC drives using dual converters.
CO3. Classify four quadrant operation to control speed of DC drives using choppers.
CO4. Compare speed control methods of induction motor drives.
CO5. Investigate speed control methods of synchronous motor drives.

UNIT - I

CONTROL OF DC MOTORS THROUGH PHASE CONTROLLED RECTIFIERS:

Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to DC separately excited and DC series motors -continuous current operation output voltage and current waveforms- Speed and Torque expressions Speed Torque Characteristics- Problems on Converter fed DC motors. Three phase semi and fully controlled converters Connected to DC separately excited and DC series motors output voltage and current waveforms Speed and Torque expressions Speed Torque characteristics - Problems.

UNIT- II

FOUR QUADRANT OPERATIONS OF DC DRIVES THROUGH DUAL CONVERTERS:

Introduction to Four quadrant operation Motoring operations, Electric Braking Plugging, Dynamic and Regenerative Braking operations, Four quadrant operation of D C motors by dual converters Closed loop operation of DC motor (Block Diagram Only).

UNIT - III

CONTROL OF DC MOTORS BY CHOPPERS (1, 2, 4 QUADRANT OPERATIONS):

Single quadrant, Two quadrant and four quadrant chopper fed separately excited and series exacted motors Continuous current operation Output voltage and current wave forms Speed torque expressions speed torque characteristics Problems on Chopper fed DC Motors Closed Loop operation (Block Diagram Only).

UNIT - IV

CONTROL OF INDUCTION MOTORS: Variable voltage& Frequency Characteristics: Control of Induction Motor by AC Voltage Controllers Waveforms speed torque characteristics. Variable frequency control of induction motor by Voltage source and current source Inverter and cyclo-converters- PWM control - Comparison of VSI and CSI operations Speed torque Characteristics numerical problems on induction motor drives Closed loop operation of induction motor delves (Block Diagram Only).

Static rotor resistance control: Slip power recovery Static Scherbius drive Static Kramer Drive their performance and speed torque characteristics advantages applications - problems.

UNIT - V

CONTROL OF SYNCHRONOUS MOTORS: Separate control & self-control of synchronous motors Operation of self-controlled synchronous motors by VSI and CSI Cycloconverters. Load commutated CSI fed Synchronous Motor - Operation Waveforms speed torque characteristics Applications -Advantages and Numerical Problems Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control, Cycloconverter, PWM, VFI, CSI. Principle of operation of BLDC motor drive.

TEXT BOOKS:

1. Fundamentals of electrical drives, G. K. Dubey, Alpha Science International Limited-2nd Edition.
2. Power Semiconductor Drives, J. Gnanavadivel, Anuradha Publications.

REFERENCE BOOKS:

1. Power semiconductor drives, PV Rao, BS Publications.
2. Thyristor control of electric drives, Vedam Subramanyam, Tata McGraw Hill Publications.
3. A first course on electrical drives, S K Pillai, New Age International (P) Ltd-2ndEdition

POWER SYSTEM PROTECTION

Department of Electrical and Electronics Engineering					III B.Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A226222	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

B. Tech. III Year II Semester

Course Outcomes:

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

CO1. Understand basic working of circuit breaker and classification of circuit breakers.
CO2. Examine different types of circuit breakers in power systems.
CO3. Analyze Principle of operation of over current, directional, differential and distance relays.
CO4. Design protection schemes for alternators, transformers, bus-bars.
CO5. Assess over voltage protection and insulation level

UNIT - I

CIRCUIT BREAKERS: Circuit Breaker (CB): Elementary principles of arc interruption, Recovery and Recovery voltages - Restriking phenomenon, average, maximum RRRV and numerical Problems. Current chopping and Resistance switching. CB ratings and specifications: Types and Numerical problems. Auto reclosing. Description and operation of following types Circuit Breakers: Minimum Oil Circuit Breaker, Air Blast Circuit Breaker, Vacuum and SF6 circuit breaker.

UNIT - II

ELECTROMAGNETIC, STATIC RELAYS & NUMERICAL RELAYS: Principle of operation and construction of attracted armature, balanced beam, induction disc and induction cup relays-classification. Instantaneous DMT and IDMT types, Applications of relays**:** Over current/under voltage relays, Directional relays, percentage differential relays. Distance relays**:** Impedance, Reactance, Mho and offset Mho relays and Characteristics of distance relays. Comparison of numerical relays & static relays with electromagnetic relays.

UNIT - III

GENERATOR & TRANSFORMER PROTECTION: Protection of generators against stator faults, Rotor faults and abnormal conditions. Restricted earth fault and inter turn fault protection. Numerical examples on percentage of winding unprotected. Protection of transformers**:** Percentage and differential protection, Numerical problems on Design of CT's ratios and Buchholz relay protection.

UNIT - IV

FEEDER AND BUS BAR PROTECTION& GROUNDING PROTECTION OF LINES:

Over current earth fault**,** Carrier current and three zone distance protection using impedance relays– Translay relay Protection of bus bars and Differential protection.

NEUTRAL GROUNDING

Grounded & ungrounded neutral systems. Effects of ungrounded neutral system performance. Methods of neutral grounding: Solid resistance, reactance, Arcing grounds& grounding practices.

UNIT - V

PROTECTION AGAINST OVER VOLTAGE AND GROUNDING: Generation of over voltages in power systems, Protection against lightning over voltages, Valve type and zinc–Oxide lighting arresters, Insulation coordination, BIL– impulse ratio. Earthing Practices in Substations.

TEXT BOOKS:

1. Power system protection and switch gear, Badriram, D. N. Viswakarma Tata McGraw Hill Education-2nd Edition.
2. Switchgear and protection, Sunil. S. Rao, Khanna publishers.

REFERENCE BOOKS:

1. Electrical power systems, C. L. Wadhwa, New age international (P) limited-4th Edition.
2. A Textbook on power system engineering, M. L. Soni, P. V. Gupta, U. S. Bhatnagar, A. Chakrabarthy, Dhanapat Rai & Co. pvt.ltd.
3. Principles of power system, V.K. Mehtha & Rohit Mehtha, S. Chand company Pvt. Ltd - 4th Edition.

POWER ELECTRONICS LABORATORY

Department of Electrical and Electronics Engineering				III B.Tech II Semester		
Course Code	Hours/Week		Credits	Marks		
A226292	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech. III Year II Semester

Course Outcomes:

Upon the completion of Laboratory course, the student will be able to

CO1. Examine the characteristics of SCR, MOSFET, & IGBT, and analyze triggering circuits.
CO2. Analyze input and output characteristics of AC-DC converters.
CO3. Synthesize input and output characteristics of Cycloconverters.
CO4. Examine input and output characteristics of DC-DC Converters.
CO5. Outline the operation of Power converter controlled motors.

LIST OF EXPERIMENTS

Any ten of the following experiments are required to be conducted.

1. Study of the characteristics of SCR
2. Study of characteristics of MOSFET & IGBT.
3. Gate Firing Circuits for SCRs (R- Triggering, RC Triggering & UJT Triggering).
4. Single Phase AC voltage Controller with R & RL Loads.
5. Single Phase fully Controlled Bridge Converter with R& RL Loads.
6. DC Jones Chopper with R & RL Loads.
7. Single Phase Parallel Inverter with R& RL Loads.
8. Single Phase Cycloconverter with R& RL Loads.
9. Single Phase Series Inverter with R& RL Loads.
10. Single Phase Half controlled converter with R Load.
11. Thyristorised drive for 1Hp DC motor with closed loop control.
12. Speed Measurement and closed loop control using PMDC motor.

SIMULATION OF POWER CONVERTERS LABORATORY

Department of Electrical and Electronics Engineering				III B.Tech II Semester		
Course Code	Hours/Week		Credits	Marks		
A226293	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech. III Year II Semester

Course Outcomes:

Upon the completion of Laboratory course, the student will be able to

CO1. Examine the characteristics of SCR, MOSFET, & IGBT, and analyze triggering circuits.
CO2. Analyze input and output characteristics of AC-DC converters.
CO3. Synthesize input and output characteristics of Cycloconverters.
CO4. Examine input and output characteristics of DC-DC Converters.
CO5. Outline the output of various Power converters

LIST OF EXPERIMENTS

Any 10 experiments from the below may be conducted

1. Simulation models of SCR, IGBT and MOSFET
2. Simulation of Single Phase Semi controlled converter
3. Simulation of Single phase fully controlled converter using RL and E loads.
4. Simulation of Three phase fully controlled converter using RL and E loads.
5. Simulation of Single phase AC Voltage controller using RL load.
6. Simulation of single phase Inverter with PWM control.
7. Simulation of Three-phase inverter with PWM controller.
8. Simulation of DC-DC Converter with various classes operation.
9. Simulation of Dual Converter with various modes of operation
10. Simulation of resonant pulse commutation circuit.
11. Simulation of Buck and Boost Converters.
12. Simulation of Voltage commutated Chopper

POWER SYSTEMS LABORATORY

Department of Electrical and Electronics Engineering				III B.Tech II Semester		
Course Code	Hours/Week		Credits	Marks		
A226294	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

B. Tech. III Year II Semester

Course Outcomes:

Upon the completion of Laboratory course, the student will be able to

CO1. Predict the sequence impedances of electrical machines
CO2. Examine the characteristics of relays
CO3. Analyze the Merz -Price protection scheme
CO4. Assess the function of over current relay, over voltage relays and transmission lines
CO5. Compute the sub-transient reactance of electrical machine

LIST OF EXPERIMENTS

Any 10 experiments from the below may be conducted

1 To find Positive, Negative and zero sequence impedances of a 3-phase, 3-Winding Transformer
2 Determination Sequence Impedances of Three Phase Transformer
3 To determine efficiency and regulation of 3-phase Transmission Line model
4 To determine characteristic of 2-overcurrent relay for 3-phase transformer protection
5 To determine the operating characteristic of Negative sequence Relay
6 Merz -Price protection scheme for 3-phase transformer
7 To determine characteristics of IDMT Over Current Relays
8 To find Positive, Negative and zero sequence impedances of a Cylindrical Rotor Synchronous Machine
9 To determine sub-transient reactance's of a Salient Pole Synchronous generator
10 To determine the characteristics of Over Voltage Relay
11 Merz -Price protection scheme for Single Phase Transformer
12 Feeder protection system for external faults

GENDER SENSITIZATION

Department of Electrical and Electronics Engineering				III B.Tech II Semester		
Course Code	Hours/Week		Credits	Marks		
A226019	L	T	P	C	CIE	SEE	Total
	2	0	0	0	40	60	100

B. Tech. III Year II Semester

Course Outcomes:

1. To develop awareness about gender discrimination and take measurable steps to counter it.
2. To identify the basic dimensions of biological, sociological, psychological and legal aspects of gender.
3. To acquire knowledge about gendered division of labour in relation to politics and economics.
4. To prepare the students against gender violence.
5. To prepare the students to work and live together a sequals.

UNIT I

UNDERSTANDING GENDER:

Gender: Why Should We Study It? (Towards a World of Equals: Unit -1)

Socialization: Making Women, Making Men (Towards a World of Equals: Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT II

GENDER AND BIOLOGY:

Missing Women: Sex Selection and Its Consequences (Towards a World of Equals: Unit -4) Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit -10) Two or Many? Struggles with Discrimination.

UNIT III

GENDER AND LABOUR:

Housework: the Invisible Labour (Towards a World of Equals: Unit -3) "My Mother doesn't Work." "Share the Load".

Women's Work: Its Politics and Economics (Towards a World of Equals: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT IV

ISSUES OF VIOLENCE:

Sexual Harassment: Say No! (Towards a World of Equals: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".

Domestic Violence: Speaking Out (Towards a World of Equals: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (Towards a World of Equals: Unit -11)

Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT V

GENDER: CO – EXISTENCE:

Just Relationships: Being Together as Equals (Towards a World of Equals: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXT BOOK:

1.Towards a World of Equals: A Bilingual Textbook on Gender,A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu ,Telugu Akademi, Hyderabad,Telangana State in the year 2015.

REFERENCE BOOKS:

1. Seeing like a feminist, Menon, Nivedita, New Delhi, Zubaan-PenguinBooks-2012
I fought for my life and won, Abdulali Sohaila, Available online at:
http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH IV YEAR COURSE STRUCTURE
(Electrical and Electronics Engineering)

Semester-I

S.No.	Course Code	Course Title	L	T	P	Credits
1	A227228	Electric and Hybrid Vehicles	3	1	0	4
2	A227229	Power System Operation and Control	3	0	0	3
3	A227231 A227232 A227233	Power Quality & FACTS Solar Power Batteries Advanced Control of Electric Drives	3	0	0	3
4	A227234 A227235	Electric Vehicles and Hybrid Vehicles Energy Storage Systems	3	0	0	3
5	A227230	Essentials of Computer Networks	2	0	0	2
6	A227295	Simulation of Renewable Energy Systems Laboratory	0	0	4	2
8	A2272PS1	Project Stage–I	0	0	6	3
		Total Credits	**14**	**1**	**10**	**20**

ELECTRIC AND HYBRID VEHICLES

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A227228	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B. Tech. IV Year I Semester

Course Outcomes:

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

CO1. Understand the components of Electric Vehicles and Fundamentals of Electric Vehicles.
CO2. Explain the types of batteries and principles of operation of batteries.
CO3. Analyze the control techniques of Electric motors which are used in Electric vehicles.
CO4. Apprehend the transmission of the drive system and the components of transmission.
CO5. Assess various modes of Hybrid vehicles for different conditions.

UNIT- I

ELECTRIC VEHICLES: Introduction to Electric Vehicles - History of Electric and Hybrid Vehicles - Component's vehicle mechanics - Roadway fundamentals - vehicle kinetics - Dynamics of vehicle motion - Propulsion System Design.

UNIT -II

BATTERIES: Basics Types -Parameters - Capacity- Discharge rate - State of charge - State of Discharge -Depth of Discharge - Technical characteristics - Battery pack - Design Properties of Batteries -Fuel Cells - Types - Fuel Cell -Electric Vehicle.

UNIT - III

DC & AC ELECTRICAL MACHINES (Speed control Techniques): Motor and Engine rating - Requirements - Speed control techniques of DC machines in Electric Vehicles - Speed control techniques of three phase A/c machines, Induction machines, Permanent Magnet Machines, Switched Reluctance Machines.

UNIT - IV

ELECTRIC VEHICLE DRIVE TRAIN: Transmission configuration Components, gears, differential, clutch, brakes, regenerative braking- motor sizing, Gear Ratio, Torque- speed characteristics, EV Motor Sizing, Initial Acceleration, Rated Vehicle Velocity, Maximum Velocity – Maximum Gradability.

UNIT - V

HYBRID ELECTRIC VEHICLES: Types of Hybrid Vehicles- series and parallel Hybrid Electric Vehicles, series- parallel configuration, Internal Combustion Engines -Reciprocating Engines- Practical and Air-Standard Cycles Air- Standard Otto Cycle Air-Standard Diesel Cycle Example IC Engines in HEVs Design Drive train sizing of components.

TEXT BOOKS:

1. Electric & hybrid vehicles Design Fundamentals, Iqbal Hussain, CRC Press 2nd Edition.
2. Electric vehicle technology explained, James Larminie, John Lowry, Wiley& Sons- 2nd Edition.

REFERENCE BOOKS:

1. Modern electric, hybrid electric, and fuel cell vehicles: fundamentals, theory and design, Mehrdad Ehsani, Yimin Gao, Ali Emadi, CRC Press - 2nd Edition.
2. Electric vehicle battery systems, Sandeep Dhameja – Kindle Edition.

POWER SYSTEM OPERATION AND CONTROL

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A227229	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B. Tech. IV Year I Semester

Course Outcomes:

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

CO1. Understand economic operation of power systems.
CO2. Analyze and compute optimal loading of generators for a particular load demand.
CO3. Develop mathematical models of turbines and governors.
CO4. Address load frequency control problem.
CO5. Explain how series and shunt compensation helps in reactive power control.

UNIT - I

ECONOMIC OPERATION OF POWER SYSTEMS: Optimal operation of Generators in Thermal Power Stations – Heat rate Curve - Cost Curve - Incremental fuel and Production costs, input-output characteristics, 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: Hydroelectric power plant models, scheduling problems- Short term hydrothermal scheduling problem.

UNIT - III

MODELING: Modeling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.

Modeling of Governor: Mathematical Modeling of Speed Governing System - Derivation of small signal transfer function.

Modeling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

UNIT - IV

LOAD FREQUENCY CONTROL: Single Area Load Frequency Control: 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. Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control.

Load Frequency Controllers: Proportional plus Integral control of single area and its block diagram representation, steady state response – Load Frequency Control and Economic dispatch control.

UNIT - V

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, I.J. Nagarath & D.P. Kothari, Tata McGraw Hill Publishing Company Ltd -4th Edition.
2. Power systems analysis and stability, S.S Vadhera, Khanna Publications- 4thEdition.

REFERENCE BOOKS:

1. Power generation, operation and control, Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheble, Wiley -3rdEdition.
2. Power system stability and control, Prabha Kundur, McGraw Hill companies-Indean Edition.
3. Power system operation and control, Dr. K. Uma Rao, Wiley India Pvt. Ltd.

ESSENTIALS OF COMPUTER NETWORKS

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A227230	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B. Tech. IV Year I Semester

Course Outcomes:

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

- **CO1.** Understand the scenario of reference models.
- **CO2.** Illustrate various sub protocols in multi access protocols.
- **CO3.** Outline various routing algorithms and their operations.
- **CO4.** Analyze transport protocols for the given scenario.
- **CO5.** Identify the protocols and functionalities in application layer

UNIT - I:

Introduction to Data Communication

Overview of the Internet: Definition of networks, Topology, Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history, Comparison of the OSI and TCP/IP reference model.

UNIT - II:

Data Link Layer - Design issues, Elementary Data Link Layer Protocols.

Medium Access Protocols - ALOHA, CSMA, Ethernet- Physical Layer, Ethernet, Mac Sub layer – CSMA/CD, Fast, Gigabit, 10-Gigabit Ethernets, Data link layer repeaters, hubs, bridges, switches, routers and gateways.

UNIT - III:

Network Layer: Network Layer Design issues, Routing algorithms - shortest path, flooding and Distance Vector Routing.

Internetworking: IP addresses, IPv4, IPv6 Protocol, subnetting

UNIT - IV:

Transport Layer: Introduction to TCP and UDP, difference between TCP & UDP, The TCP Connection Management Modeling, and The TCP Congestion Control.

UNIT - V:

Application Layer- Introduction, providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, DNS.

TEXT BOOKS:

1. Data Communications and Networking - Behrouz A. Forouzan, TMH, 2013, Fifth Edition
2. Computer Networks - Andrew S Tanenbaum, Pearson Education, 4th Edition

REFERENCE BOOKS:

1. An Engineering Approach To Computer Networks-S.Keshav, Pearson Education,2nd Edition
2. Understanding Communications And Networks, W.A.Shay, Cengage Learning, 3rd Edition.
3. Introduction To Computer Networks And Cyber Security, Chwan-Hwa (John)Wu, J.David Irwin, CRC Press.

SIMULATION OF RENEWABLE ENERGY SYSTEMS LABORATORY

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A227295	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B. Tech. IV Year I Semester

Course Outcomes:

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

CO1. Understand PV energy conversion system
CO2. Interpret irradiation, temperature effect on PV array
CO3. Assessment of Solar power system
CO4. Understand wind energy conversion system and Fuel cell
CO5. Inspect the Hybrid renewable energy power system

Any 10 experiments from the following experiments may be conducted

1. Simulation study on Solar PV Energy System.
2. Formation of Admittance bus
3. Simulation study on GS method load flow analysis
4. Experiment on "VI-Characteristics and Efficiency of Solar PV System".
5. Effect of irradiation on PV array
6. Effect of temperature on PV array
7. Experiment on Performance assessment of Standalone Solar Power System.
8. Experiment on Performance assessment of Grid connected Solar Power System
9. Simulation study on Wind Energy Generator.
10. Experiment on Performance assessment of microWind Energy Generator.
11. Study on Hybrid (Solar-Wind) Power System.
12. Study on Performance Assessment of Fuel

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. TECH IV YEAR COURSE STRUCTURE
(Electrical and Electronics Engineering)

Semester-II

S.No.	Course Code	Course Title	L	T	P	Credits
1	A228236	Utilization of Electrical Energy	3	0	0	3
2	A228237	Power Electronic Applications to Renewable Energy Systems	3	0	0	3
3	A228238 A228239 A228240	Smart Grid Technologies Machine Learning Applications to Electrical Engineering Embedded Systems	3	0	0	3
4	A2282PS2	Project Stage–II	0	0	20	9
5	A2282TS	Seminar	0	0	02	2
		Total Credits	**9**	**0**	**22**	**20**

UTILIZATION OF ELECTRICAL ENERGY

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A2278236	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B. Tech. IV Year II Semester

Course Outcomes:

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

CO1. Understand the importance of illumination and various illumination techniques.
CO2. Examine the performance of simple resistance furnaces, modern welding techniques.
CO3. Apply the concepts of Electrolytic process
CO4. Categorize different types of Electric Traction systems
CO5. Evaluate different types of traction mechanics

UNIT – I

ILLUMINATION: Definition – Laws of illumination – Polar curves – Calculation of MHCP and MSCP. Lamps: Incandescent lamp, Sodium Vapour lamp, Fluorescent lamp. Requirement of good lighting scheme – Types, Design and Calculation of illumination. Street lighting and Factory lighting – Numerical Problems.

UNIT – II

ELECTRICAL HEATING & ELECTRIC WELDING: Advantages, Methods of Electric heating – Resistance, arc, Induction and dielectric heating. Types of electric welding – Resistance, Electric arc, gas welding and Ultrasonic welding, Welding electrodes of various metals, Defects in welding.

UNIT – III

ELECTROLYTIC PROCESS: Basic principle of Electrolysis, Faradays laws of Electrolysis – Numerical problems, Applications of Electrolysis – Electro deposition-manufacturing of chemicals – anodizing – electro polishing – electro cleaning – electro parting – electro metallurgy, Power supply for Electrolysis.

UNIT – IV

ELECTRIC TRACTION: Introduction –Traction Systems, Systems of Electric Traction-Advantages of Electric Traction, Systems of Track Electrification, Desirable features of Traction Motors – Suitability of D.C. series motor, A.C. series motor, 3 phase induction motor and linear induction motor for traction. Electric Braking in traction - Plugging, Rheostatic and

Regenerative types – Suitability of different motors for braking, Temperature Rise and Load Equalization.

UNIT – V

TRACTION MECHANICS: Types of services – urban – sub-urban and main line services, Speed-time curves of different services – trapezoidal and quadrilateral speed-time curves – Numerical Problems, Tractive effort, Power, Specific Energy Consumption- factors affecting Specific Energy Consumption, Mechanics of train movement - Adhesive weight and coefficient of adhesion – Problems.

TEXT BOOKS:

1. Utilization of Electric Power, Er. R. K. Rajput, Laxmi Publications, 2nd Edition
2. Utilization of Electric Power and Electric Traction, J.B. Gupta, S.K. Kataria and sons, Delhi. Art & Science of Utilization of electrical Energy – by H. Partab, Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Generation, Distribution and Utilization of Electrical Energy‟ by C. L. Wadhwa, Eastern . Wiley Ltd.
2. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited Publishers, 1996.
3. A text book on Power System Engineering‟ by A. Chakraborti, M. L. Soni, P. V. Gupta, U.S.Bhatnagar, Dhanpat Rai and Co.(P) Ltd – Delhi.

POWER ELECTRONIC APPLICATIONS TO RENEWABLE ENERGY SYSTEMS

Department of Humanities & Sciences				I B.Tech I Semester		
Course Code	Hours/Week		Credits	Marks		
A228237	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

B. Tech. IV Year II Semester

Course Outcomes:

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

CO1. acquire knowledge on Non-Conventional energy sources
CO2. analyze various DC-DC converter technologies used for renewable energy systems
CO3. Design inverters for renewable energy systems
CO4. Develop power extraction and supply schemes for wind energy systems
CO5. develop stand alone DG sets and micro grid systems from renewable energy sources

UNIT - I

Introduction to renewable sources: world energy scenario, Wind, solar, hydro, geothermal, availability and power extraction.
Introduction to solar energy: Photovoltaic effect, basics of power generation, P-V &I-V characteristics, effect of insolation, temperature, diurnal variation, shading, Modules, connections, ratings, Power extraction (MPP) tracking and MPPT schemes; standalone systems, grid interface, storage, AC-DC loads.

UNIT - II

DC-DC converters for solar PV: buck/boost/buck-boost /flyback /forward/cuk, bidirectional converters, Interleaved and multi-input converters.

UNIT - III

Grid connected Inverters: 1ph, 3ph inverters with & w/o x'mer, Heric, H6, Multilevel Neutral point clamp, Modular multilevel, CSI; Control schemes: unipolar, bipolar, PLL and synchronization, power balancing / bypass, Parallel power processing; Grid connection issues: leakage current, Islanding, harmonics, active/reactive power feeding, unbalance.

UNIT - IV

Introduction to wind energy: P-V, I-V characteristic, wind power system: turbine-generator-inverter, mechanical control, ratings; Power extraction (MPP) and MPPT schemes. Generators for wind: DC generator with DC to AC converters; Induction generator with & w/o converter.

UNIT - V

Synchronous generator with back to back controlled/ uncontrolled converter; Doubly fed induction generator with rotor side converter topologies; permanent magnet based generators. Battery: Types, charging discharging. Introduction to AC and DC microgrids.

TEXT BOOKS:

1. Sudipta Chakraborty, Marcelo G. Simes, and William E. Kramer. Power Electronics for Renewable and Distributed Energy Systems: A Sourcebook of Topologies, Control and Integration. Springer Science & Business, 2013.

2. Nicola Femia, Giovanni Petrone, Giovanni Spagnuolo, Massimo Vitelli, Power Electronics and control for maximum Energy Harvesting in Photovoltaic Systems, CRC Press, 2013. 3. Chetan Singh Solanki, Solar Photovoltaics: fundamentals, Technologies and Applications, Prentice Hall of India, 2011.

REFERENCE BOOKS:

1. N. Mohan, T.M. Undeland & W. P. Robbins, Power Electronics: Converter, Applications & Design, John Wiley & Sons, 1989

2. Muhammad H. Rashid, Power Electronics: Circuits, Devices, and Applications, Pearson Education India, 2004

3. E. Guba, P. Sanchis, A. Ursa, J. Lpez, and L. Marroyo, Ground currents in single-phase transformerless photovoltaic systems, Progress in Photovoltaics: Research and Applications, vol. 15, no. 7, 2007.

4. Remus Teodorescu, Marco Liserre, Pedro Rodriguez, Grid Converters for Photovoltaic and Wind Power Systems, John Wiley and Sons, Ltd., 2011.

5. Ali Keyhani, Design of Smart Power Grid Renewable Energy Systems, Wiley-IEEE Press, 2011.

PROFESSIONAL ELECTIVES

IoT APPLICATIONS IN ELECTRICAL ENGINEERING

(Professional Elective – I)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A225216	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B. Tech. III Year I Semester

Course Outcomes:

The students should be able to

CO1. Understand the various fundamentals, architectures and technologies of Internet of Things.

CO2. Discuss about various communication technologies used in the Internet of Things.

CO3. Acquire knowledge on the various device connectivity methods using web and internet in the IoT environment.

CO4. Explore various data acquisition methods, data handling using cloud for IoT applications.

CO5. Apply IoT to design Smart Home, Smart city, agriculture practices etc.

UNIT - I

The Internet of Things An overview of internet of things (IoT) – IoT framework – Architecture technology behind IoT – Sources of the IoT – M2M communication – Examples of IoT.

UNIT – II

Design Principles for Connected Devices: Introduction –IoT/M2M systems, layers and designs, standardization – Communication technologies – Data enrichment, consolidation and device management at gateway – Ease of designing and affordability.

UNIT – III

Design Principles for the Web Connectivity: Introduction – Web communication protocols for connected devices - Message communication protocols for connected devices – Web connectivity for connected devices network.

Introduction to internet connectivity principles, internet connectivity, internet based communication – IP addressing in the IoT – Application layer protocols: HTTP, HTTPS, FTP, Telnet, WAP (Wireless Application Protocol).

UNIT – IV

Data Acquiring, Organizing, Processing and Analytics: Introduction – Data acquiring and storage – Organizing the data – Analytics.

Data Collection, Storage and Computing Using a Cloud Platform: Introduction – Cloud computing paradigm for data collection, storage and computing – IoTas a service and cloud service Models – IoT cloud based services using the Xively (Pachube/COSM), Nimbits and other platforms.

UNIT – V

Sensor technology: Actuator, sensor data communication protocols, radio frequency identification technology, wireless sensor network technology. IoT application case studies: Smart home, smart cities, environment monitoring and agriculture practices.

TEXT BOOKS:

1. Internet of Things: Architecture, Design Principles, Raj Kamal, McGraw Hill Education (India) Pvt. Limited, 2017.

REFERENCE BOOKS:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley, First edition, 2013.
2. Getting Started with the Internet of Things, CunoPfister, O'reilly, 2011.
3. Internet of Things : A Hands-on Approach, Arshdeep Bahga, and Vijay Madisetti, 2014

ELECTRICAL ENERGY CONSERVATION AND AUDITING

(Professional Elective-1)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A225217	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B. Tech. III Year I Semester

Course Outcomes:

After completion of this course, students are able to:

CO1. Know the current energy scenario and importance of energy auditing.
CO2. Understand the concepts of energy auditing.
CO3. Evaluate the performance of existing engineering systems
CO4. Explore the methods of improving energy efficiency in different engineering systems
CO5. Design different energy efficient devices.

UNIT- I

Basics of Energy and its various forms: Overview of engineering, elements Solar energy, electricity generation methods using solar energy, PV cell, elements of wind energy, electricity generation using wind energy, elements of bio energy, bio mass energy conservation, elements of geothermal energy, sources of geothermal energy, sources of chemical energy, fuel cells, Energy Scenario in India

UNIT- II

Energy Auditing-1: Introduction: Need for energy audit, directions for the study of energy auditing, inclusions for energy auditing, types of energy audit: preliminary audit, general/mini audit, investment-grade/ comprehensive audit. Major energy consuming equipments and systems, energy audit team, energy auditing methodology: preliminary and detailed. Process flow diagram, energy audit report format

UNIT- III

Energy Auditing-2: For buildings: Energy auditing instruments, energy efficiency, energy auditing for buildings: stages in programs, surveying, measurements and model analysis. Energy audit form of commercial buildings, checklist for energy saving measures

UNIT - IV

Energy Efficient Technologies-I: Importance of energy efficiency for engineers, Energy efficient technology

in mechanical engineering: Heating, ventilation and air-conditioning, boiler and steam distribution systems

Energy efficient technology in civil engineering: future of roads, harnessing road and transport infrastructure;

UNIT - V

Energy Efficient Technologies-II : Energy efficient technology in electrical engineering: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors; Energy efficient technology in chemical engineering: green chemistry, low carbon cements, recycling paper

TEXT BOOKS:

1. Energy Management, Umesh Rathore,, Kataria publications, 2nd ediiton, 2014.
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects

REFERENCES:

1. Hargroves, K., Gockowiak, K., Wilson, K., Lawry, N., and Desha, C. (2014) An Overview of Energy Efficiency Opportunities in Mechanical/civil/electrical/chemical Engineering, The University of Adelaide and Queensland University of Technology.
2. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

CYBER PHYSICAL SYSTEMS

(Professional Elective - I)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A225218	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B.Tech III Year I Semester

Course Outcomes:

At the end of the course students should be able to:

CO1. Understand the concept of Cyber Physical System.
CO2. Apply CPS platform components to develop Cyber Physical Systems.
CO3. Develop solution using synchronous and asynchronous models.
CO4. Apply concepts of security to enhance existing systems.
CO5. Ability to develop concepts, logics towards solving problem in research and industry.

UNIT - I :

Introduction: Cyber-Physical System, Key Features of CPS, Application Domains of CPS, Basic principles of design and validation of CPS, Challenges in CPS.

UNIT – II :

CPS Platform components: CPS HW platforms, Processors, Sensors and Actuators, CPS Network - Wireless, CAN, Automotive Ethernet, Scheduling Real Time CPS tasks, Synchronous Model and Asynchronous Model.

UNIT – III :

Synchronous and Asynchronous Model: Reactive Components, Components Properties, Components Composing, Synchronous Designs and Circuits, Asynchronous Processes and operations, Design Primitives in Asynchronous Process, Coordination Protocols in Asynchronous Process, Leader
Election, Reliable Transmission.

UNIT – IV:

Security of Cyber-Physical Systems: Introduction to CPS Securities, Basic Techniques in CPS Securities, Cyber Security Requirements, Attack Model and Countermeasures, Ddvanced Techniques in CPS Securities.

UNIT – V:

CPS Application: Health care and Medical Cyber-Physical Systems, Smart grid and Energy Cyber Physical Systems, WSN based Cyber-Physical Systems, Smart Cities.

TEXT BOOKS:

1. E. A. Lee and S. A. Seshia, “Introduction to Embedded Systems: A Cyber-Physical Systems Approach”, 2011.
2. R. Alur, “Principles of Cyber-Physical Systems,” MIT Press, 2015.

REFERENCE BOOKS:

1. Raj Rajkumar, Dionisio de Niz and Mark Klein, "Cyber-Physical Systems", Addison-Wesley,
2017
2. Rajeev Alur, "Principles of Cyber-Physical Systems", MIT Press, 2015
3. Fei Hu, "Cyber-Physical Systems", CRC Press 2013

AI TECHNIQUES IN ELECTRICAL ENGINEERING

(Professional Elective-II)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A226223	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B. Tech. III Year II Semester

Course Outcomes:

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

CO1. Understand artificial neural networks.

CO2. Generalize feed forward neural networks, feedback neural networks and learning techniques.

CO3. Identify fuzziness involved in various systems and fuzzy set theory.

CO4. Discover fuzzy logic control for applications in electrical engineering.

CO5. Interpret genetic algorithm for applications in electrical engineering.

UNIT - I

ARTIFICIAL NEURAL NETWORKS: Introduction, Models of Neuron Network-Architectures Knowledge representation, Artificial Intelligence and Neural networks–Learning process-Error correction learning, Hebbian learning Competitive learning-Boltzman learning, supervised learning-Unsupervised learning. Reinforcement learning - Learning tasks.

UNIT- II

ANN PARADIGMS: Multi-layer perceptron using Back propagation Algorithm (BPA), Self –Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network.

UNIT - III

FUZZY LOGIC: Introduction: Fuzzy versus crisp, Fuzzy sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets. Fuzzy Cartesian Product, Operations on Fuzzy relations Fuzzy logic, Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.

UNIT - IV

GENETIC ALGORITHMS: Introduction-Encoding Fitness Function-Reproduction operators, Genetic Modeling Genetic operators-Cross over-Single site cross over, Two point cross over Multi point cross over Uniform cross over, Matrix cross over-Crossover Rate-Inversion & Deletion, Mutation operator Mutation Mutation Rate-Bit-wise operators, Generational cycle-convergence of Genetic Algorithm.

UNIT V

APPLICATIONS OF AI TECHNIQUES: Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area system and two area system, Reactive power control, Speed control of DC and AC Motors.

TEXT BOOKS:

1. Neural networks, fuzzy logic and genetic algorithms, S.Rajasekaran and G.A.V.Pai PHI, New Delhi.
2. Neural networks: A comprehensive foundation, Simon O Haykin, International Edition-2nd Edition.

REFERENCE BOOKS:

1. Neural computing theory & practice, P.D.Wasserman & Van Nostrand Reinhold, New York.
2. Neural network & fuzzy system, Bart Kosko, PrenticeHall.
3. Genetic algorithms, D.E.Goldberg, Pearson Education.

MODERN POWER ELECTRONICS
(Professional Elective-II)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A226224	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B. Tech. III Year II Semester

Course Outcomes:

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

CO1. Define the advances in power electronic devices.
CO2. Articulate power electronic resonant converters in power control applications.
CO3. Evaluate the design and control of multi-level inverters.
CO4. Articulate DC power supplies in Power electronic applications
CO5. Evaluate the design and control of AC power supplies and uninterruptable power supplies.

UNIT - I

Modern power semiconductor devices: Modern power semiconductor devices- MOS turn Off Thyristor (MTO) - Emitter Turn Off Thyristor (ETO) Integrated Gate- Commutated Thyristor (IGCTs)-MOS-controlled Thyristors (MCTs)-Static Induction circuit comparison of their features.

UNIT - II

Resonant Pulse Inverters: Resonant pulse inverters-series resonant inverters-series resonant inverters with unidirectional switches series resonant inverters with bidirectional Switches analysis of half bridge resonant inverter - evaluation of currents and Voltages of a simple resonant inverter-analysis of half bridge and full bridge resonant inverter with bidirectional switches.

UNIT - III

Multilevel Inverters: Multi level concept-Classification of multilevel inverters- Diode clamped multilevel inverter- principle of operation-main features improved diode - Clamped inverter-principle of operation-Flying capacitors multilevel inverter principle of operation-main features.

UNIT - IV

DC Power Supplies: DC power supplies-classification-switched mode dc power supplies-fly back Converter -forward converter- push pull converter-half bridge converter-Full bridge converter-Resonant dc power supplies-bidirectional dc power supplies-Applications.

UNIT - V

AC Power Supplies: AC power supplies classification-switched mode ac power supplies. Resonant AC power supplies-bi directional ac power supplies-multi stage conversions-control circuits - applications. Introduction-power line disturbances-power conditioners - uninterruptible Power supplies applications.

TEXT BOOKS

1. Power Electronics -Mohammed H. Rashid, Pearson Education - Third Edition
2. Power Electronics - Ned Mohan, Tore M. Undeland and William P. Robbins - John Wiley and Sons Second Edition.

WIND AND SOLAR ENERGY SYSTEMS

(Professional Elective - II)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A226225	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B.Tech. III Year II Sem.

Course Outcomes:

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

CO1. Understand the basic physics of Wind Power.
CO2. Outline Wind turbine technologies and their operation. generation.
CO3. Understand the basics of Solar Power.
CO4. Apply the concepts of power electronic interfaces for wind and solar generation.
CO5. Analyze the technologies used for Solar Power generation.

UNIT - I

Physics of Wind Power

History of wind power, Indian and Global statistics, Wind physics, Betz limit ratio, stall and pitch control, Wind speed statistics-probability distributions, and Wind power-cumulative distribution functions.

UNIT - II

Wind Generator Topologies

Review of modern wind turbine technologies, Fixed and Variable speed wind turbine, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent Magnet Synchronous Generators, Power electronics converters. Generator configurations, Converter Control.

UNIT - III

The Solar Resource

Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar daylength, Estimation of solar energy availability.

Solar Photovoltaic

Technologies-Amorphous, mono-crystalline, polycrystalline; V-I characteristics of a PV cell, PV module,array, Power Electronic Converters for Solar Systems, Maximum Power point Tracking (MPPT) algorithms. Converter Control.

UNIT - IV

Network Integration Issues

Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system

interconnection experiences in the world. Hybrid andisolated operations of solar PV and wind systems.

UNIT - V

Solar Thermal Power Generation

Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

TEXT BOOKS:

1. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005.
2. G. M. Masters, "Renewable and Efficient Electric Power Systems**",** John Wiley and Sons, 2004.

REFERENCE BOOKS:

1. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill,1984.
2. H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" JohnWiley and Sons Ltd., 2006.
3. G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004.
4. J. A. Duffie and W. A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Sons,1991.

POWER QUALITY AND FACTS
(Professional Elective-III)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A227231	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B. Tech. IV Year I Semester

Course Outcomes:

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

CO1. Understand the severity of power quality problems in distribution system
CO2. Illustrate the concept of transmission line reactive power compensation
CO3. Choose proper shunt compensators for reactive power compensation
CO4. Apply the control circuits of static series compensators for various functions
CO5. Classify combined compensators.

UNIT - I

POWER QUALITY PROBLEMS IN DISTRIBUTION SYSTEMS: Power Quality problems in distribution systems: Transient and Steady state variations in voltage and frequency. Unbalance, Sags, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations. Flicker and its measurement.

UNIT- II

TRANSMISSION LINES AND SERIES/SHUNT REACTIVE POWER COMPENSATION:

Basics of AC Transmission. Analysis of uncompensated AC transmission lines. Passive Reactive Power compensation. Shunt and series compensation at the mid-point of an AC line. Comparison of Series and Shunt Compensation.

UNIT- III

STATIC SHUNT COMPENSATORS: Objectives of shunt compensation, Methods of controllable VAR generation, Static Var Compensator, its characteristics, TCR, TSC, FC-TCR configurations, STATCOM, basic operating principle, control approaches and characteristics

UNIT- IV

STATIC SERIES COMPENSATORS: Objectives of series compensator, variable impedance type of series compensators, TCSC, TSSC-operating principles and control schemes, SSSC, Power Angle characteristics, Control range and VAR rating, Capability to provide reactive power compensation, external control

UNIT-V:

COMBINED COMPENSATORS: Introduction to Unified Power Flow Controller, Basic operating principles, Conventional control capabilities, independent control of real and reactive power.

TEXT BOOKS:

1. Electrical Power Systems Quality, Dugan Roger C, Santoso Surya, Mc Granaghan, Marks F.Beaty and H. Wayre, Mc Graw Hill
2. Power Systems Quality Assessment, J. Arillaga, N.R. Watson, S.Clon, John Wiley.

REFERENCE BOOKS:

1. Power Quality, C.Sankaran, CRC Press 4. Understanding power quality problems, Math H.Bollen, IEEE press.
2. Understanding FACTS –Concepts and Technology of Flexible AC Transmission Systems, Narain G.Honorani, Laszlo Gyugyi

SOLAR POWER BATTERIES

(Professional Elective -III)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A227232	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B. Tech. IV Year I Semester

Course Outcomes:

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

CO1. Understand the PV Solar cell technologies
CO2. Illustrate the connections of solar PV module arrays.
CO3. Choose proper battery types and connections
CO4. Apply control techniques for inverter
CO5. Design Solar PV systems.

UNIT – I :

Photovoltaic Solar Cell and its function,:

Solar Technologies, Solar Cell Parameters, Efficiency of Solar Cell, Solar PV Module, Rating of Solar PV Module, PV Module Parameters Solar, Efficiency of PV Module, Measuring Module Parameters.

UNIT – II

Solar Photovoltaic Module Array

Connection of PV Module in Series and Parallel, Estimation and Measurement of PV Module Power, Selection of PV Module.

UNIT - III

Batteries

Battery function, Types of Batteries, Battery parameters, Selection of Battery, Series Parallel combination of Batteries, Batteries for Photo voltaic System, Application of Batteries in Solar PV system, Battery Maintenance and Measurements, Battery Fault Detection and Test, Battery Installation for PV system.

UNIT – IV:

Charge Controller, MPPT and Inverter

Power MOSFET and IGBT, Opto coupler, Buck and Boost Converter, Fly back Converter, Full Bridge Inverter, Voltage and Current Feedback, DC to DC power converter, DC to AC Converter, AC to DC Converter, Battery Charge controller, Maximum Power Point Tracking, Specification of Inverter and charger.

UNIT – V :

Solar PV System Design and Integration

Solar Radiation Energy Measurements, Estimating Energy requirement, Types of Solar PV System, Design methodology for SPV system, Design of Off Grid Solar Power Plant, Case studies of 3KWp Off grid Solar PV Power Plant.

TEXT BOOKS :

1. Solar Photovoltaic Technology and Systems A Manual for Technicians, Trainers and Engineers, Chetan Singh Solanki, PHI Learning Private Ltd.

REFERENCE BOOKS:

1. Design, Installation and Operation of Solar PV Plants, Dhirendra Kumar Tyagi, Mangolia Publication

2. A Practical Guide for Total Engineering of MW capacity Solar PV Power Project, A.S.Kapur, White Falcon Publishing, 2nd edition

ADVANCED CONTROL OF ELECTRIC DRIVES

(Professional Elective - III)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A227233	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B.Tech. IV Year I Semester

Course Outcomes:

At the end of the Course, the student will be able to:

CO1. Understand the operation of power electronic converters and their control strategies.
CO2. Apply the vector control strategies for ac motor drives
CO3. Examine the control of Synchronous Motor Drives
CO4. Analyze the speed control of Permanent Magnet motors and Switched Reluctance Motors.
CO5. Distinguish the implementation of the control strategies using digital signal processors.

UNIT - I

POWER CONVERTERS FOR AC DRIVES: PWM control of inverter, selected harmonic elimination, space vector modulation, current control of VSI, three level inverter, Different topologies, SVM for 3 level inverter, Diode rectifier with boost chopper, PWM converter as line side rectifier, current fed inverters with self-commutated devices. Control of CSI, H Bridge as a 4-Q drive.

UNIT - II

INDUCTION MOTOR DRIVES: Different transformations and reference frame theory, modeling of induction machines, voltage fed inverter control-v/f control, vector control, direct torque and flux control (DTC).

UNIT - III

SYNCHRONOUS MOTOR DRIVES: Modeling of synchronous machines, open loop v/f control, vector control, direct torque control, CSI fed synchronous motor drives.

UNIT - IV

PERMANENT MAGNET MOTOR DRIVES: Introduction to various PM motors, BLDC and PMSM drive configuration, comparison, block diagrams, Speed and torque control in BLDC and PMSM.

Switched Reluctance Motor Drives: Evolution of switched reluctance motors- various topologies for SRM drives, comparison, closed loop speed and torque control of SRM.

UNIT - V

DSP BASED MOTION CONTROL: Use of DSPs in motion control, various DSPs available, and realization of some basic blocks in DSP for implementation of DSP based motion control.

TEXT BOOKS:

1. Modern Power Electronics and AC Drives, B. K. Bose, Pearson Education, Asia, 2003.
2. Analysis of Electric Machinery and Drive Systems, P. C. Krause, O. Wasynczuk and S. D. Sudhoff, John Wiley & Sons, 2013.

REFERENCE BOOKS:

1. H. A. Taliyat and S. G. Campbell, “DSP based Electromechanical Motion Control”, CRC press, 2003.
2. R. Krishnan, “Permanent Magnet Synchronous and Brushless DC motor Drives”, CRC Press,2009.

SMART GRID TECHNOLOGIES

(Professional Elective-IV)

Department of Humanities & Sciences				I B.Tech I Semester		
Course Code	Hours/Week		Credits	Marks		
A228238	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B. Tech. IV Year II Semester

Course Outcomes:

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

CO1. Understand the features of Smart Grid.
CO2. Illustrate the smart grid architecture.
CO3. Explain tools and techniques for smart grid and Distribution systems.
CO4. Justify operation and importance of PMUs, WAMS.
CO5. Imagine control techniques for micro grid and smart grid.

UNIT – I

INTRODUCTION TO SMART GRID: Introduction to Smart Grid – Working – definitions of Smart Grid and Associated Concepts – Smart Grid Functions -Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid.

UNIT – II

SMART GRID ARCHITECTURE: Components and Architecture of Smart Grid Design – Review of the proposed architectures for Smart Grid, fundamental components of Smart Grid designs, Transmission Automation, Distribution Automation – Renewable energy Integration.

UNIT – III

COMPUTATIONAL TECHNIQUES FOR SMART GRIDS:

Tools and Techniques for Smart Grid: Computational Techniques Static and Dynamic Optimization Techniques, Computational Intelligence Techniques, Evolutionary Algorithms and Artificial Intelligence techniques.

Distribution Generation Technologies: Introduction to Renewable Energy Technologies- Micro grids – Storage Technologies -Electric Vehicles and plug in hybrids Environmental impact and Climate Change Economic Issues.

UNIT – IV

COMMUNICATION TECHNOLOGIES AND SMART GRID: Introduction to Communication Technology – Synchro-Phasor Measurement Units (PMUs) – Wide Area Measurement Systems (WAMS) – Introduction to Internet of Things (IOT) – Applications of IOT in Smart Grid.

UNIT – V

CONTROL OF SMART POWER GRID SYSTEM: Load Frequency Control (LFC) in Micro Grid System – Voltage Control in Micro Grid System -Reactive Power Control in Smart Grid, Case Studies and Test beds for the Smart Grids.

TEXT BOOKS:

1. Smart grids, infrastructure, technology and solutions, Stuart Borlase, CRC Press – 1st Edition.

2. Renewable and efficient electric power system, Gil Masters, Wiley IEEE Press 2nd Edition.

REFERENCE BOOKS:

1. Synchronized Phasor measurements and their applications, A.G. Phadke and J.S Thorp, Springer 2nd Edition.
2. Wind power in power systems, T. Ackermann, Hoboken, NJ, USA, John Wiley 2nd Edition.

Machine Learning Applications to Electrical Engineering
(Professional Elective-IV)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A228239	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

B. Tech. IV Year II Semester

Course Outcomes:

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

CO1. Understand the concepts of computational intelligence like machine learning
CO2. Examine the operation of Neural Networks .
CO3. Assess maximum likelihood with the help of Bayesian learning.
CO4. Apply the concepts of Genetic Algorithm .
CO5. Apply machine learning techniques to address the real time problems in Electrical Engineering

Unit-I :

Introduction -

Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm.

Linear Regression, Logistic Regression and Classification (elementary treatment only)

Decision Tree Learning –Introduction, decision tree representation, the basic decision tree learning algorithm

Unit-II :

Artificial Neural Networks

Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Evaluation Hypotheses

Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

Unit- III

Bayesian learning –

Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities

Computational learning theory

Introduction, probably learning an approximately correct hypothesis

Instance-Based Learning

Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions

Unit- IV

Genetic Algorithms –

Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules –

Introduction, sequential covering algorithms, learning rule sets

Reinforcement Learning –

Introduction, the learning task, Q–learning, non-deterministic, rewards and actions, temporal difference learning,

Unit- V:

Applications in Electrical Engineering

Applications of Machine learning in Electric Vehicles, Prediction of power quality, Electrical Price prediction.

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning Algorithms and Applications in Engineering, Prasenjit Chatterjee, Morteza Yazdani, Francisco Fernández-Navarro, Javier Pérez-Rodríguez, CRC Press, 1st edition 2023

REFERENCES:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

EMBEDDED SYSTEMS

(Professional Elective-IV)

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A228240	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

Course Outcomes:

Upon completing this course, the student will be able to

CO1. Understand the selection procedure of Processors in the embedded domain.
CO2. Examine Embedded system components and operation
CO3. Design Procedure for Embedded Firmware.
CO4. Visualize the role of Real time Operating Systems in Embedded Systems.
CO5. Evaluate the Correlation between task synchronization and latency issues

Unit-I :

Introduction to Embedded Systems:

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes 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), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Unit-III :

Embedded Firmware:

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

Unit-IV :

RTOS Based Embedded System Design:

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Unit-V :

Task Communication:

Shared Memory, Message Passing, Remote Procedure Call and Sockets,
Task Synchronization:
Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, Methods to Choose an RTOS.

TEXT BOOKS:

1. Introduction to Embedded Systems – Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS:

1. Embedded Systems – Raj Kamal, TMH.
2. Embedded System Design – Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer – David E. Simon, Pearson Education.