ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABI
OF
ELECTRICAL AND ELECTRONICS ENGINEERING
FOR
B.TECH REGULAR FOUR YEAR DEGREE PROGRAM

(for the batches admitted from 2016-2017)

&

FOR B.TECH LATERAL ENTRY PROGRAM

(for the batches admitted from 2017-2018)

CHOICE BASED CREDIT SYSTEM

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

(Affiliated to JNTUA Anantapuramu, Approved by AICTE
Accredited by NBA; NAAC with 'A' grade)

Sree Sainath Nagar, A.Rangampet, Near Tirupati - 517 102. A.P.

VISION

To be one of the Nation's premier Engineering Colleges by achieving the highest order of excellence in Teaching and Research.

MISSION

- To foster intellectual curiosity, pursuit and dissemination of knowledge.
- To explore students' potential through academic freedom and integrity.
- To promote technical mastery and nurture skilled professionals to face competition in ever increasing complex world.

QUALITY POLICY

Sree Vidyanikethan Engineering College strives to establish a system of Quality Assurance to continuously address, monitor and evaluate the quality of education offered to students, thus promoting effective teaching processes for the benefit of students and making the College a Centre of Excellence for Engineering and Technological studies.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To become the Nation's premiere centre of excellence in electrical engineering through teaching, training, research and innovation to create competent engineering professionals with values and ethics.

MISSION

- Department of Electrical Engineering strives to create human resources in Electrical Engineering to contribute to the nation development and improve the quality of life.

- Imparting Knowledge through implementing modern curriculum, academic flexibility and learner centric teaching methods in Electrical Engineering

- Inspiring students for aptitude to research and innovation by exposing them to industry and societal needs to creating solutions for contemporary problems

- Honing technical and soft skills for enhanced learning outcomes and employability of students with diverse background through comprehensive training methodologies

- Inculcate values and ethics among students for a holistic engineering professional practice.

PROGRAM EDUCATIONAL OBJECTIVES

Within few years of graduation, graduates will

1. have enrolled in academic program in the disciplines of electrical engineering and multidisciplinary areas.
2. become entrepreneurs or be employed as productive and valued engineers in reputed industries.
3. engage in lifelong learning, career enhancement and adopt to changing professional and societal needs.

PROGRAM OUTCOMES

On successful completion of the program, engineering graduates will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and concepts of engineering to the solution of complex engineering problems. (Engineering knowledge)
2. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (Problem analysis)
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. (Design/development of solutions)
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. (Conduct investigations of complex problems)
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. (Modern tool usage)
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. (The engineer and society)

7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development. (Environment and sustainability)
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. (Ethics)
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. (Individual and team work)
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. (Communication)
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. (Project management and finance)
12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. (Life-long learning)

PROGRAM SPECIFIC OUTCOMES

On successful completion of the program, engineering graduates will

1. Demonstrate knowledge of Electrical and Electronic circuits, Electrical Machines, Power Systems, Control Systems, and Power Electronics for solving problems in electrical and electronics engineering.
2. Analyze, design, test and maintain electrical systems to meet the specific needs of the Industry and society.
3. Conduct investigations to address complex engineering problems in the areas of Electrical Machines, Power Systems, Control Systems and Power Electronics.
4. Apply appropriate techniques, resources and modern tools to provide solutions for problems related to electrical and electronics engineering.

The Challenge of Change

*"**M**astery of change is in fact the challenge of moving human attention from an old state to a new state. Leaders can shift attention at the right time and to the right place. The real crisis of our times is the crisis of attention. Those who lead are the ones who can hold your attention and move it in a purposeful way. Transformation is nothing but a shift in attention from one form to another. The form of a beautiful butterfly breaks free from a crawling caterpillar. If you pay enough attention, you would be able to see how the butterfly hides within the caterpillar. The leader points out a butterfly when the follower sees only a caterpillar".*

- Debashis Chatterjee

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)
(Affiliated to J.N.T. University Anantapur, Anantapuramu)

ACADEMIC REGULATIONS

CHOICE BASED CREDIT SYSTEM

B.Tech. Regular Four Year Degree Program (for the batches admitted from the academic year 2016–17) & B.Tech. (Lateral Entry Scheme) (for the batches admitted from the academic year 2017–18)

For pursuing four year undergraduate Degree Program of study in Engineering (B.Tech) offered by Sree Vidyanikethan Engineering College under Autonomous status and herein after referred to as SVEC (Autonomous):

1. Applicability : All the rules specified herein, approved by the Academic Council, shall be in force and applicable to students admitted from the academic year 2016-2017 onwards. Any reference to "College" in these rules and regulations stands for SVEC (Autonomous).

2. Extent: All the rules and regulations, specified hereinafter shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. It shall be ratified by Academic Council in the forth coming meeting. As per the requirements of statutory bodies, Principal, Sree Vidyanikethan Engineering College shall be the Chairman, Academic Council.

3. Admission :

3.1. Admission into First Year of Four Year B.Tech. Degree Program of study in Engineering:

3.1.1. Eligibility: A candidate seeking admission into the First Year of four year B.Tech. Degree Program should have
(i) passed either Intermediate Public Examination (I.P.E.) conducted by the Board of Intermediate Education, Andhra Pradesh, with Mathematics, Physics and Chemistry as optional courses (or any equivalent examination recognized by JNTUA, Anantapuramu) for admission as per the guidelines of Andhra Pradesh State Council of Higher Education (APSCHE).

(ii) secured a rank in the EAMCET examination conducted by APSCHE for allotment of a seat by the Convener, EAMCET for admission.

3.1.2. **Admission Procedure:** Admissions shall be made into the first year of four year B.Tech. Degree Program as per the stipulations of APSCHE, Government of Andhra Pradesh:
(a) By the Convener, EAMCET, (for Category-A Seats).
(b) By the Management (for Category-B Seats).

3.2. Admission into the Second Year of Four year B.Tech Degree Program in Engineering (Lateral Entry).

3.2.1. **Eligibility:** A candidate seeking admission into the Second Year of four year B.Tech. Degree Program (Lateral Entry) should have
(i) Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or equivalent Diploma recognized by JNTUA, Anantapuramu).
(ii) Candidates qualified in ECET and admitted by the Convener, ECET. In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained.

3.2.2. **Admission Procedure:** 20% of the sanctioned strength in each Program of study as lateral entry students or as stipulated by APSCHE shall be filled by the Convener, ECET.

4. Programs of study offered leading to the award of B.Tech. Degree Following are the four year undergraduate Degree Programs of study offered in various branches in SVEC (Autonomous) leading to the award of B.Tech (Bachelor of Technology) Degree:
1) B.Tech (Civil Engineering)
2) B.Tech (Computer Science & Engineering)
3) B.Tech (Computer Science & Systems Engineering)
4) B.Tech (Electrical & Electronics Engineering)
5) B.Tech (Electronics & Communication Engineering)
6) B.Tech (Electronics & Instrumentation Engineering)
7) B.Tech (Information Technology)
8) B.Tech (Mechanical Engineering)

5. Duration of the Program:

5.1 **Minimum Duration:** The program will extend over a period of four years leading to the Degree of Bachelor of Technology (B.Tech) of the JNTUA, Ananthapuramu. The four academic years will be divided into eight semesters with two semesters per year. Each semester shall normally consist of 22 weeks (?90 working days) having - Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System

(CBSS) as suggested by UGC and Curriculum/ Course Structure as suggested by AICTE are followed. Provision is made for lateral entry of students in the Second Year of the program in all branches of study and they will be required to satisfy the conditions of admissions thereto prescribed by the JNTUA, Ananthapuramu and Government of Andhra Pradesh.

5.2 Maximum Duration: The student shall complete all the passing requirements of the B.Tech degree program within a maximum duration of 8 years (6 years for lateral entry), these durations reckoned from the commencement of the semester to which the student was first admitted to the program.

First Semester (22 weeks)	Instruction Period: I Spell : 7 weeks II Spell: 9 weeks	16 weeks
	Mid-term Examinations: I Mid : 1 week II Mid : 1 week	2 weeks
	Preparation & Practical Examinations	2 weeks
	Semester-end examinations	2 weeks
	Semester Break	2 weeks
Second Semester (22 weeks)	Instruction Period: I Spell : 7 weeks II Spell: 9 weeks	16 weeks
	Mid-term Examinations: I Mid :1 week II Mid : 1 week	2 weeks
	Preparation & Practical Examinations	2 weeks
	Semester-end examinations	2 weeks
	Summer Vacation	6 weeks

6. Structure of the Program: Each Program of study shall consist of:
   (a) Foundation Courses,
   (b) Core Courses and Elective Courses.

♦ Foundation Courses are further categorized as :
   (i) HS (Humanities and Social Sciences),
   (ii) BS (Basic Sciences) and
   (iii) ES (Engineering Sciences).

♦ Core Courses and Elective Courses are categorized as PS (Professional Courses), which are further subdivided as:
   (i) PC (Professional Core) Courses,
   (ii) PE (Professional Electives),
   (iii) IDE (Inter Disciplinary Electives),
   (iv) OE (Open Electives),
   (v) Comprehensive Assessment
   (vi) Seminar
   (vii) PW (Project Work).

S.No	Broad Course Classification	Course Group/ Category	Course Type	Range of Credits
1.	Foundation Courses	HS – Humanities and Social Sciences	Humanities, Social Sciences and Management.	**5% - 10%**
2.		BS – Basic Sciences	Mathematics, Physics and Chemistry Courses, etc.	**15% - 20%**
3.		ES – Engineering Sciences	Fundamental engineering courses.	**15% - 20%**
4.	Core Courses	PC – Professional Core	Core courses related to the Parent Discipline/ Branch of Engg.	**30% - 40%**
5.	Elective Courses	PE – Professional Electives	Elective courses related to the Parent Discipline/ Branch of Engg.	**10% - 15%**
6.		IDE - Interdisciplinary Electives	Courses in an area outside the Parent Discipline / Branch of Engg.	**5% - 10%**
7.		OE – Open Electives	Common Elective courses offered for all programs / Branches of Engg.	**5% - 10%**
8.	Core Courses	Seminar	A course of study with discussion and report.	**10% - 15%**
9.		Comprehensive Assessment	A comprehensive review of foundations and key concepts of the courses studied.	
10.		Project Work	A course of planned minor research work.	

Contact Periods: Depending on the complexity and volume of the course, the number of contact periods per week shall be assigned.

7. Credit Courses:

All Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each 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 Period/ Week/ Semester for Theory/ Lecture (L) Courses;
- Two Credits - for Three Periods/ Week/ Semester for Laboratory/ Practical (P) Courses.

- Tutorials will not carry Credits.
    i) Other student activities like NCC, NSS, Sports, Study Tour, Guest Lecture etc. will not carry Credits.
    ii) For courses like Project/Seminar/Comprehensive Online Assessment, where formal contact periods are not specified, credits are assigned based on the complexity of the work to be carried out.

The four year curriculum of any B. Tech Program of study shall have total of **180** credits (24 credits in each semester from I B. Tech. I Semester to IV B. Tech I Semester and 12 credits in IV B. Tech II Semester). However the curriculum for lateral entry students shall have a total of **132** credits (24 credits in each semester from II B. Tech. I Semester to IV B. Tech I Semester and 12 credits in IV B. Tech II Semester).

8. Choice Based Credit System (CBCS):

Choice Based Credit System (CBCS) is introduced based on UGC guidelines in order to promote:

- Student centered learning
- Cafeteria approach
- Students to learn courses of their choice
- Learning at their own pace
- Interdisciplinary learning
- A student is introduced to "Choice Based Credit System (CBCS)"
- The total credits for the Program is **180** for regular students and **132** for lateral entry students.
- A student has a choice of registering for credits from the theory courses offered in the program ensuring the total credits in a semester are between 21 and 30.
- From the II B.Tech I Semester to IV B.Tech I Semester, the student has the option of registering for additional theory courses from the latter semesters or dropping existing theory courses of the current semester within the course structure of the program. However the number of credits the student can register in a particular semester should not below 21 (minimum) and should not exceed 30 (maximum).
- Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

All the registered credits will be considered for the calculation of final CGPA.

9. Course Enrollment and Registration

9.1 Each student, on admission shall be assigned to a Faculty Advisor (Mentor) who shall advice and counsel the student about the details of the academic programme and the choice of courses considering the student's academic background and career objectives.

9.2 Each student on admission shall register for all the courses prescribed in the curriculum in the student's first and second Semesters of study. The student shall enroll for the courses with the help of the student's Faculty Advisor (Mentor). The enrollment for the courses from II B.Tech I Semester to IV B.Tech I Semester will commence 10 days prior to the last instructional day of the preceding semester for registration process. If the student wishes, the student may drop or add courses (vide clause 8) within Ten days before commencement of the concerned semester and complete the registration process duly authorized by the Chairman, Board of studies of concern department.

9.3 If any student fails to register the courses in a semester, he shall undergo the courses as per the program structure.

9.4 After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the Semester-end Examinations.

9.5 No course shall be offered by a Department unless a minimum of 40 students register for that course.

10. Massive Open Online Course (MOOC)

A Massive Open Online Course (MOOC) is an online course aimed at unlimited participation and open access via the web. MOOC is a model for delivering learning content online to any person who takes a course, with no limit on attendance.

- A student shall undergo a "Massive Open Online Course (MOOC)" for award of the degree besides other requirements.
- A student is offered this Online Course at the beginning of his III B.Tech I Semester of study and the course has to be completed by the end of III B.Tech II Semester. If the student fails to complete the course by the end of III B.Tech II Semester, it shall be treated as a backlog and needs to be completed before completion of the program for the award of the degree.
- The student shall confirm registration by enrolling the course within 10 days prior to the last instructional day of the II B. Tech. II Semester like other courses.
- The courses will be approved by the Chairman, Academic Council, SVEC based on the recommendations of the Chairman, Board of Studies of concerned program considering current needs.
- A student has a choice of registering for only one MOOC with the recommendation of Chairman, Board of studies of concerned program and duly approved by the Chairman, Academic Council, SVEC.

- The student shall undergo MOOC without disturbing the normal schedule of regular class work.
- One faculty member assigned by the Head of the Department shall be responsible for the periodic monitoring of the course implementation.
- No formal lectures need be delivered by the faculty member assigned to the students.
- If any student wants to change the MOOC course already registered, he will be given choice to register a new MOOC course in III B. Tech. only, with the recommendation of Chairman, Board of studies of concerned program and duly approved by the Chairman, Academic Council, SVEC.
- Finally, the performance of the student in the course will be evaluated as stipulated by the course provider. A certificate will be issued on successful completion of the course by the course provider.
- The performance in the MOOC will not be considered for the calculation of SGPA and CGPA of the student.
- The MOOC course will be listed in the grade sheet of the student.

11. Break of Study from a Program (Gap Year)

11.1 A student is permitted to go on break of study for a maximum period of two years either as two breaks of one year each or a single break of two years.

11.2 The student shall apply for break of study in advance, in any case, not later than the last date of the first assessment period in a semester. The application downloaded from website and duly filled by the student shall be submitted to the Head of the Department. In the case of start-up for incubation of idea only, the application for break of study shall be forwarded by the Head of the Department to the Principal, SVEC. A sub-committee appointed by the principal shall give recommendations for approval.

11.3 The students permitted to rejoin the programme after break of study shall be governed by the Curriculum and Regulations in force at the time of rejoining. The students rejoining in new regulations shall apply to the Principal, SVEC in the prescribed format through Head of the Department at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.

11.4 The total period for completion of the programme reckoned from the commencement of the I B.Tech I Semester to which the student was admitted shall not exceed the maximum period specified in clause 5.2 irrespective of the period of break of study in order that the student may be eligible for the award of the degree (vide clause 18).

11.5 In case, if a student applies for break of study for one year and wishes to extend it for one more consecutive year, he shall be permitted with the prior approval of the Principal, SVEC through the concerned Head of the Department before beginning of the semester in which the student has taken break of study.

11.6 If a student has not reported to the department after approved period of break of study without any intimation, the student is treated as detained in that semester. Such students are eligible for readmission for the semester when offered next.

12. Examination System: All components in any Program of study shall be evaluated through internal evaluation and / or an external evaluation conducted as Semester-end examination.

Sl. No.	Course	Marks	Examination and Evaluation		Scheme of examination
1.	Theory	70	Semester-end examination of 3 hours duration (External evaluation)		The examination question paper in theory courses shall be for a maximum of 70 marks. The question paper shall be of descriptive type with 5 questions, taken one from each unit of syllabus, having internal choice and all 5 questions shall be answered. All questions carry equal marks.
		30	Mid-term Examination of 2 hours duration (Internal evaluation).		The question paper shall be of descriptive type with 4 essay type questions out of which 3 are to be answered and evaluated for 24 marks and also 6 short answer questions out of which all are to be answered and evaluated for 6 marks.
					Two mid-term examinations each for 30 marks are to be conducted. For a total of 30 marks, 75% of better one of the two and 25% of the other one are added and finalized. **Mid-I:** After first spell of instruction (I to II Units). **Mid-II**: After second spell of instruction (III to V Units).
2	Laboratory	50	Semester-end Lab Examination for 3 hours duration (External evaluation)		50 marks are allotted for laboratory/drawing examination during semester-end.
		50	30	Day-to-Day evaluation for Performance in laboratory experiments and Record. (Internal evaluation).	Two laboratory examinations, which includes Day-to-Day evaluation and Practical test, each for 50 marks are to be evaluated. For a total of 50 marks 75% of better one of the two and 25% of the other one are added and finalized. **Laboratory examination-I:** Shall be conducted just before I mid-term examinations. **Laboratory examination-II:** Shall be conducted just before II mid-term examinations.
			20	Practical test (Internal evaluation).	
3	a) Seminar	100	Semester-end Examination		100 marks are allotted for Seminar during semester-end evaluation by the Seminar Evaluation Committees (**SECs**) as given in 12.2.1.
	b)Comprehensive Assessment	100	Semester-end Examination		Comprehensive Assessment shall be conducted as given in 12.2.2 as semester-end evaluation for 100 marks.
4	Project Work	200	100	External evaluation	Semester-end Project Viva-Voce Examination by Committee as detailed in 12.2.3 for 100 marks.
			100	Internal evaluation	Continuous evaluation by the Project Evaluation Committees (**PECs**) as detailed in 12.2.3 for 100 marks.

12.2 Seminar/Comprehensive Assessment /Project Work Evaluation:

12.2.1 For the seminar, the student shall collect information through literature survey on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the Department just before presentation. The report and the presentation shall be evaluated at the end of the semester by the Seminar Evaluation Committees (SECs), each consisting of concerned supervisor and two senior faculty members. The SECs are constituted by the Principal on the recommendations of the Head of the Department.

12.2.2 Comprehensive Assessment shall be conducted by the department through (i) online with 50 objective questions for 50 marks and (ii) viva-voce for the remaining 50 marks, covering all the courses from I B.Tech I Semester to IV B.Tech I Semester. The viva-voce will be conducted by Comprehensive Assessment Committees (CACs), each consisting of three faculty members (out of whom at least two are seniors). The CACs are constituted by the Principal on the recommendations of the Head of the Department. The HODs of the respective departments are given the responsibility of preparing question bank/question paper for conducting the online examination.

12.2.3 The project Viva-Voce examination shall be conducted by a Committee consisting of External examiner (nominated by the Chief Controller of Examinations), HOD and concerned Supervisor. The evaluation of project work shall be conducted at the end of the IV B.Tech II Semester. The Internal Evaluation shall be made by the Project Evaluation Committees (PECs), each consisting of concerned supervisor and two senior faculty members on the basis of two project reviews conducted on the topic of the project. The PECs are constituted by the Principal on the recommendations of the Head of the Department.

12.3. Eligibility to appear for the semester-end examination:

12.3.1 A student shall be eligible to appear for semester-end examinations if he acquires a minimum of 75% of attendance in aggregate of all the courses in a semester.

12.3.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

12.3.3 Shortage of Attendance below 65% in aggregate shall in no case be condoned.

12.3.4 Students whose shortage of attendance is not condoned in any semester is not eligible to take their end examination of that class and their registration shall stand cancelled.

12.3.5 A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the current semester, as applicable. The student may seek readmission for the semester when offered next. He will not be allowed to register for the courses of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

12.3.6 A stipulated fee shall be payable to the College towards condonation of shortage of attendance.

12.4. Evaluation: Following procedure governs the evaluation.

12.4.1. Marks for components evaluated internally by the faculty shall be submitted to the Controller of Examinations one week before the commencement of the End examinations. The marks for the internal evaluation components shall be added to the external evaluation marks secured in the Semester-end examinations, to arrive at total marks for any course in that semester.

12.4.2. Performance in all the courses is tabulated course-wise and shall be scrutinized by the Results Committee and moderation is applied if needed and course-wise marks are finalized. Total marks obtained in each course are converted into letter grades.

12.4.3. Student-wise tabulation shall be done and individual grade Sheet shall be generated and issued to the student.

12.5. Personal verification / Revaluation / Recounting:
Students shall be permitted for personal verification/request for recounting/ revaluation of the Semester-end examination answer scripts within a stipulated period after payment of prescribed fee. After recounting or revaluation, records are updated with changes if any and the student shall be issued a revised grade sheet. If there are no changes, the student shall be intimated the same through a notice.

12.6. Supplementary Examination:
In addition to the regular semester-end examinations conducted, the College may also schedule and conduct supplementary examinations for all the courses of other semesters when feasible for the benefit of students. Such of the candidates writing supplementary examinations may have to write more than one examination per day.

13. Academic Requirements for promotion/ completion of regular B.Tech Program of study:
The following academic requirements have to be satisfied in addition to the attendance requirements for promotion/ completion of regular B.Tech Program of study.

For students admitted into B.Tech. (Regular) Program:

13.1 A student shall be deemed to have satisfied the minimum academic requirements for each theory, laboratory course and project work, if he secures not less than 40% of marks in the semester-end examination and a minimum of 40% of marks in the sum total of the internal evaluation and Semester-end examination taken together. For the seminar and comprehensive Viva-Voce, he should secure not less than 40% of marks in the semester-end examination.

13.2 A student shall be promoted from second year to third year of Program of study only if he fulfills the academic requirement of securing 36 credits from

a. Two regular and one supplementary examinations of I B.Tech I Semester.
b. O ne regular and one supplementary examinations of I B.Tech II Semester.
c. One regular examination of II B.Tech I Semester.

Irrespective of whether or not the candidate appears for the semester-end examination as per the normal course of study.

13.3 A student shall be promoted from third year to fourth year of Program of study only if he fulfills the academic requirements of securing 60 credits from the following examinations,

a. Three regular and two supplementary examinations of I B.Tech I Semester.
b. Two regular and two supplementary examinations of I B.Tech II Semester.
c. Two regular and one supplementary examinations of II B.Tech I Semester.
d. One regular and one supplementary examinations of II B.Tech II Semester.
e. One regular examination of III B.Tech I Semester.

Irrespective of whether or not the candidate appears for the semester-end examination as per the normal course of study and in case of getting detained for want of credits by sections 13.2 and 13.3 above, the student may make up the credits through supplementary examinations.

13.4 A student shall register for all the 180 credits and earn all the 180 credits. Marks obtained in all the 180 credits shall be considered for the calculation of the DIVISION based on CGPA.

13.5 A student who fails to earn 180 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit his seat in B.Tech. Program and his admission stands cancelled.

For Lateral Entry Students (batches admitted from the academic year 2017-2018):

13.6 A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical course and project, if he secures not less than 40% of marks in the semester-end examination and a minimum of 40% of marks in the sum total of the internal evaluation and semester-end examination taken together. For the seminar and comprehensive Viva-Voce, he should secure not less than 40% of marks in the semester-end examination.

13.7 A student shall be promoted from third year to fourth year only if he fulfills the academic requirements of securing 36 credits from the following examinations.

a. Two regular and one supplementary examinations of II B.Tech I Semester.

b. One regular and one supplementary examinations of II B.Tech II Semester.

c. One regular examination of III B.Tech I Semester.

Irrespective of whether or not the candidate appears for the semester-end examination as per the normal course of study and in case of getting detained for want of credits the student may make up the credits through supplementary examinations.

13.8 A student shall register for all 132 credits and earn all the 132 credits. Marks obtained in all the 132 credits shall be considered for the calculation of the DIVISION based on CGPA.

13.9 A student who fails to earn 132 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit his seat in B.Tech Program and his admission stands cancelled.

14. Transitory Regulations:

Students who got detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the Program in earlier regulations (or) who have discontinued and wish to continue the Program are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent courses as and when courses are offered and they will be in the academic regulations into which they are presently readmitted.

A regular student has to satisfy all the eligibility requirements within the maximum stipulated period of eight years and a lateral entry student within six years for the award of B.Tech Degree.

15. Grades, Semester Grade Point Average and Cumulative Grade Point Average:

15.1. Grade System: After all the components and sub-components of any course (including laboratory courses) are evaluated, the final total marks obtained shall be converted into letter grades on a "10 point scale" as described below.

Grades conversion and Grade points attached

% of Marks obtained	Grade	Description of Grade	Grade Points (GP)
> = 95	O	Outstanding	10
> = 85 to < 95	S	Superior	9
> = 75 to < 85	A	Excellent	8
> = 65 to < 75	B	Very Good	7
> = 55 to < 65	C	Good	6
> = 45 to < 55	D	Fair	5
> = 40 to < 45	E	Pass	4
< 40	F	Fail	0
Not Appeared	N	Absent	0

Pass Marks: A student shall be declared to have passed theory course, laboratory course and project work if he secures minimum of 40% marks in external examination, and a minimum of 40% marks in the sum total of internal evaluation and external examination taken together. For the seminar and comprehensive Assessment, he shall be declared to have passed if he secures minimum of 40% of marks in the semester-end examination. Otherwise he shall be awarded fail grade - **F** in such a course irrespective of internal marks. **F** is considered as a fail grade indicating that the student has to pass the semester-end examination in that course in future and obtain a grade other than **F** and **N** for passing the course.

15.2. Semester Grade Point Average (SGPA): SGPA shall be calculated as given below on a "10 point scale" as an index of the student's performance at the end of each semester:

$$SGPA = \frac{\sum(C\ X\ GP)}{\sum C}$$

where C denotes the credits assigned to the courses undertaken in that semester and GP denotes the grade points earned by the student in the respective courses.

Note: SGPA is calculated only for the candidates who passed all the courses in that Semester.

15.3. Cumulative Grade Point Average (CGPA):

The CGPA for any student is awarded only when he completes the Program i.e., when the student passes in all the courses prescribed in the Program. The CGPA is computed on a 10 point scale as given below:

$$CGPA = \frac{\sum(C\ X\ GP)}{\sum C}$$

where C denotes the credits assigned to courses undertaken up to the end of the Program and GP denotes the grade points earned by the student in the respective courses.

16. **Grade Sheet:** A grade sheet (Marks Memorandum) shall be issued to each student indicating his performance in all courses registered in that semester indicating the **SGPA.**

17. **Consolidated Grade Sheet:** After successful completion of the entire Program of study, a Consolidated Grade Sheet containing performance of all academic years shall be issued as a final record. Duplicate Consolidated Grade Sheet will also be issued, if required, after payment of requisite fee.

18. **Award of Degree**: The Degree shall be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on the recommendations of the Chairman, Academic Council of SVEC (Autonomous).

18.1. **Eligibility:** A student shall be eligible for the award of B.Tech Degree if he fulfills all the following conditions:

- Registered and successfully completed all the components prescribed in the Program of study to which he is admitted.
- Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of study within the stipulated time.
- Obtained CGPA greater than or equal to 4.0 (Minimum requirement for declaring as passed).
- Has no dues to the College, Hostel, Library etc. and to any other amenities provided by the College.
- No disciplinary action is pending against him.

18.2. **Award of Division:** Declaration of Division is based on CGPA.

Awarding of Division

CGPA	Division
> = 7.0	First Class with Distinction
> = 6.0 and < 7.0	First Class
> = 5.0 and < 6.0	Second Class
> = 4.0 and < 5.0	Pass Class

19. **Additional academic regulations:**

19.1 A student may appear for any number of supplementary examinations within the stipulated time to fulfill regulatory requirements for award of the degree.

19.2 In case of malpractice/improper conduct during the examinations, guidelines shall be followed as given in the Annexure-I.

19.3 Courses such as Project, Seminar and Comprehensive Assessment may be repeated only by registering in supplementary examinations.

19.4 When a student is absent for any examination (Mid-term or Semester-end) he shall be awarded zero marks in that component (course) and grading will be done accordingly.

19.5 When a component is cancelled as a penalty, he shall be awarded zero marks in that component.

20. Withholding of Results:

If the candidate has not paid dues to the College/University (or) if any case of indiscipline is pending against him, the result of the candidate shall be withheld and he will not be allowed/ promoted to the next higher semester.

21. Amendments to regulations:

The Academic Council of SVEC (Autonomous) reserves the right to revise, amend, or change the Regulations, Scheme of Examinations, and / or Syllabi or any other policy relevant to the needs of the society or industrial requirements etc., with the recommendations of the concerned Board(s) of Studies.

22. Attendance for student development activity periods indicated in the class time tables shall be considered as in the case of a regular course for calculation of overall percentage of attendance in a semester.

23. General:

The words such as "he", "him", "his" and "himself" shall be understood to include all students irrespective of gender connotation.

Note: Failure to read and understand the regulations is not an excuse.

Annexure-I

GUIDELINES FOR DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

Rule No.	Nature of Malpractices/ Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.

(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including labs and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for four consecutive semesters from class work and all Semester-end examinations, if his involvement is established. Otherwise, The candidate is debarred for two consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

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

7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat.

Note: Whenever the performance of a student is cancelled in any course(s) due to Malpractice, he has to register for Semester-end Examinations in that course(s) consequently and has to fulfill all the norms required for the award of Degree.

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

COURSE STRUCTURE (2016-2017)

ELECTRICAL AND ELECTRONICS ENGINEERING

I B.Tech. (I Semester)

S. No.	Course	Course Title	Contact Periods/ Week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
I Year - I Semester										
1	16BT1BS02	Engineering Physics	3	1	--	4	3	30	70	100
2	16BT1BS03	Matrices and Numerical Methods	3	1	--	4	3	30	70	100
3	16BT1BS04	Multi-variable calculus and Differential equations	3	1	--	4	3	30	70	100
4	16BT10201	Electric Circuits	4	1	--	5	4	30	70	100
5	16BT10501	Programming in C	3	1	--	4	3	30	70	100
6	16BT1BS32	Engineering Physics Lab	--	--	3	3	2	50	50	100
7	16BT10231	Electric Circuits Lab	--	--	3	3	2	50	50	100
8	16BT10232	Electrical and Electronics Workshop Practice	--	--	3	3	2	50	50	100
9	16BT10531	Programming in C Lab	--	--	3	3	2	50	50	100
		Total	**16**	**5**	**12**	**33**	**24**	**350**	**550**	**900**

I B.Tech. (II Semester)

S. No.	Course	Course Title	Contact Periods/ Week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
I Year - II Semester										
1	16BT1HS01	Technical English	3	1	--	4	3	30	70	100
2	16BT1BS01	Engineering Chemistry	3	1	--	4	3	30	70	100
3	16BT2BS01	Transformation Techniques and Partial Differential Equations	3	1	--	4	3	30	70	100
4	16BT20401	Electronic Devices and Circuits	3	1	--	4	3	30	70	100
5	16BT20541	Foundations of Data Structures	3	1	--	4	3	30	70	100
6	16BT1HS31	English Language Lab	--	--	3	3	2	50	50	100
7	16BT1BS31	Engineering Chemistry Lab	--	--	3	3	2	50	50	100
8	16BT10331	Computer Aided Engineering Drawing	--	1	6	7	3	50	50	100
9	16BT20551	Foundations of Data Structures Lab	--	--	3	3	2	50	50	100
		Total	**15**	**6**	**15**	**36**	**24**	**350**	**550**	**900**

II B.Tech. (I Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
II Year - I Semester										
1	16BT3HS01	Environmental Studies	3	--	--	3	3	30	70	100
2	16BT3BS02	Special Functions and Complex Analysis	3	1	--	4	3	30	70	100
3	16BT30201	DC Machines	3	1	--	4	3	30	70	100
4	16BT30202	Electromagnetic Fields	3	1	--	4	3	30	70	100
5	16BT30203	Signals, Systems and Networks	3	1	--	4	3	30	70	100
6	16BT30441	Analog Electronic Circuits	3	1	--	4	3	30	70	100
7	16BT30231	DC Machines Lab	--	--	3	3	2	50	50	100
8	16BT30232	Signals and Networks Lab	--	--	3	3	2	50	50	100
9	16BT30451	Analog Electronic Circuits Lab	--	--	3	3	2	50	50	100
		TOTAL	**18**	**5**	**9**	**32**	**24**	**330**	**570**	**900**

II B.Tech. (II Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
II Year - II Semester										
1	16BT40201	Electrical Measurements	3	1	--	4	3	30	70	100
2	16BT40202	Generation of Electric Power	3	1	--	4	3	30	70	100
3	16BT40203	Transformers and Induction Machines	3	1	--	4	3	30	70	100
4	16BT41002	Linear and Digital ICs	3	1	--	4	3	30	70	100
5	16BT30403	Switching Theory and Logic Design	3	1	--	4	3	30	70	100
6	16BT41041	Computer Architecture and Organization	3	1	--	4	3	30	70	100
7	16BT40231	Electrical Measurements Lab	--	--	3	3	2	50	50	100
8	16BT40232	Transformers and Induction Machines Lab	--	--	3	3	2	50	50	100
9	16BT41033	Linear and Digital ICs lab	--	--	3	3	2	50	50	100
		Total	**18**	**6**	**9**	**33**	**24**	**330**	**570**	**900**

III B.Tech. (I Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
III Year - I Semester										
1	16BT3HS02	Managerial Economics and Principles of Accountancy	3	1	--	4	3	30	70	100
2	16BT50201	Control Systems	3	1	--	4	3	30	70	100
3	16BT50202	Power Electronics	3	1	--	4	3	30	70	100
4	16BT50203	Synchronous Machines	3	1	--	4	3	30	70	100
5	16BT50204	Transmission and Distribution	3	1	--	4	3	30	70	100
Interdisciplinary Elective-1										
6	16BT40502	Database Management Systems	3	1	--	4	3	30	70	100
	16BT51003	Principles of Communications								
	16BT51041	Sensors and Signal Conditioning								
	16BT31501	Operating Systems								
7	16BT50231	Control Systems Lab	--	--	3	3	2	50	50	100
8	16BT50232	Synchronous Machines Lab	--	--	3	3	2	50	50	100
9	16BT4HS31	Soft Skills Lab	--	--	3	3	2	50	50	100
		Total	**18**	**6**	**9**	**33**	**24**	**330**	**570**	**900**

III B.Tech. (II Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
III Year - II Semester										
1	16BT5HS01	Management Science	3	1	--	4	3	30	70	100
2	16BT60201	Power Semiconductor Drives	3	1	--	4	3	30	70	100
3	16BT60202	Power System Analysis	3	1	--	4	3	30	70	100
Interdisciplinary Elective-2										
4	16BT50501	Computer Networks	3	1	--	4	3	30	70	100
	16BT61001	ARM Processors and PIC Microcontrollers								
	16BT61041	Programmable Logic Controllers								
	16BT51241	Object Oriented Programming								
Program Elective-1										
5	16BT60203	Design and Estimation of Electrical Systems	3	1	--	4	3	30	70	100
	16BT60204	Digital Signal Processing for Electrical Engineers								
	16BT60205	Electrical Machine Design								
	16BT60206	HVDC Transmission								
Program Elective-2										
6	16BT60207	Advanced Control Systems	3	1	--	4	3	30	70	100
	16BT60208	High Voltage Engineering								
	16BT60209	Instrumentation								
	16BT60210	Special Electrical Machines								
7	16BT60231	Power Electronics and Drives Lab	--	--	3	3	2	50	50	100
8	16BT60232	Power System – I Lab	--	--	3	3	2	50	50	100

IV B.Tech. (I Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
IV Year - I Semester										
1	16BT70201	Power System Operation and Control	3	1	--	4	3	30	70	100
2	16BT70402	Embedded Systems	3	1	--	4	3	30	70	100
3	16BT70202	Switchgear and Protection	3	1	--	4	3	30	70	100
4	**Program Elective-3**		3	1	--	4	3	30	70	100
	16BT70203	Energy Conservation and Management								
	16BT70204	Flexible AC Transmission systems								
	16BT70205	Power System Automation								
	16BT70206	Power System Reliability								
5	**Program Elective-4**		3	1	--	4	3	30	70	100
	16BT70207	Analysis of Power Electronic Converters								
	16BT70208	Power Quality								
	16BT70209	Smart Grid Technology								
	16BT70210	Soft Computing Techniques								
6	**Open Elective**		3	1	--	4	3	30	70	100
7	16BT70231	Power System – II Lab	--	--	3	3	2	50	50	100
8	16BT70432	Embedded Systems Lab	--	--	3	3	2	50	50	100
9	16BT70232	Comprehensive Assessment	--	--	--	--	2	--	100	100
		Total	**18**	**6**	**6**	**30**	**24**	**280**	**620**	**900**

Sl. No.	Course Code	Open Elective Course Title
1	16BT6HS01	Banking and Insurance
2	16BT6HS02	Business Communication and Career Skills
3	16BT6HS03	Cost Accounting and Financial Management
4	16BT6HS04	Entrepreneurship for Micro, Small and Medium Enterprises
5	16BT6HS05	French Language
6	16BT6HS06	German Language
7	16BT6HS07	Indian Constitution
8	16BT6HS08	Indian Economy
9	16BT6HS09	Indian Heritage and Culture
10	16BT6HS10	Indian History
11	16BT6HS11	Personality Development
12	16BT6HS12	Philosophy of Education
13	16BT6HS13	Public Administration
14	16BT60112	Building Maintenance and Repair
15	16BT60113	Contract Laws and Regulations
16	16BT60114	Disaster Mitigation and Management
17	16BT60115	Environmental Pollution and Control
18	16BT60116	Planning for Sustainable Development
19	16BT60117	Professional Ethics
20	16BT60118	Rural Technology
21	16BT60308	Global Strategy and Technology
22	16BT60309	Intellectual Property Rights and Management
23	16BT60310	Managing Innovation and Entrepreneurship
24	16BT60311	Materials Science
25	16BT70412	Green Technologies
26	16BT70413	Introduction to Nanoscience and Technology
27	16BT60505	Engineering System Analysis and Design
28	16BT71011	Micro-Electro-Mechanical Systems
29	16BT61205	Cyber Security and Laws
30	16BT61505	Bio-informatics

IV B.Tech. (II Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
IV Year - II Semester										
1	16BT80231	Project Work *	--	--	--	--	12	100	100	200
		Total	--	--	--	--	**12**	**100**	**100**	**200**

*Full-time project work

I B. Tech. - I Semester

(16BT1BS02) **ENGINEERING PHYSICS**

(Common to ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	*70*	*100*	*3*	*1*	*--*	*3*

PRE-REQUISITES: Intermediate / senior secondary Physics

COURSE DESCRIPTION:

Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. demonstrate basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nanomaterials.

CO2. analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.

CO3. demonstrate skills in designing lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.

CO4. develop problem solving skills in engineering context.

CO5. use relevant techniques for assessing ball milling, pulsed laser deposition, p-n junction and Laser

DETAILED SYLLABUS:

UNIT-I: LASERS AND FIBER OPTICS (11 periods)

Lasers: Introduction, characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein's coefficients - condition for amplification, population inversion, Nd:YAG laser, Helium-Neon laser, semiconductor laser and applications of lasers.

Fiber optics: Introduction, principle of optical fiber, acceptance angle, acceptance cone and numerical aperture, classification of optical fibers, optical fiber communication system and applications of optical fibers.

UNIT-II: PRINCIPLES OF QUANTUM MECHANICS AND BAND THEORY OF SOLIDS (07 periods)

Principles of Quantum Mechanics: Introduction, de-Broglie's hypothesis, Schrödinger's one dimensional wave equation (time independent), significance of wave function, particle in a one dimensional potential box, Fermi-Dirac distribution and effect of temperature (qualitative treatment).

Band Theory of Solids: Electron in a periodic potential, Kronig-Penney model (qualitative treatment), origin of energy bands formation in solids, distinction between conductors, semiconductors and insulators based on band theory.

UNIT-III: SEMICONDUCTORS AND DIELECTRIC PROPERTIES OF MATERIALS (13 periods)

Semiconductors: Introduction, types of semiconductors, intrinsic carrier concentration, electrical conductivity in semiconductors, drift and diffusion currents, Einstein's relation, Hall effect and its applications, direct and indirect band gap semiconductors, p-n junction, energy band diagram of p-n diode, LED, photo diode and Solar cell.

Dielectric Properties of Materials: Introduction, dielectric constant, electronic, ionic and orientation polarizations (qualitative treatment), local field, frequency dependence of polarizability (qualitative treatment), ferroelectricity.

UNIT-IV:ACOUSTICS OF BUILDINGS AND SUPERCONDUCTIVITY (07 periods)

Acoustics of Buildings: Introduction, basic requirement of acoustically good hall, reverberation and time of reverberation, Sabine's formula for reverberation time (qualitative treatment), absorption coefficient of sound and its measurement, factors affecting the architectural acoustics and their remedies.

Superconductivity: Introduction, General properties - Meissner effect, penetration depth, Type-I and Type-II superconductors, flux quantization, Josephson effects, BCS theory (qualitative treatment), applications of superconductors.

UNIT-V:CRYSTALLOGRAPHY AND NANOMATERIALS (07 p*eriods*)

Crystallography: Introduction, crystal planes, crystal directions and Miller indices, separation between successive (hkl) planes, X-ray diffraction by crystal planes, Bragg's law-powder method.

Nanomaterials: Introduction, principles of nanomaterials, properties of nanomaterials, synthesis of nanomaterials by ball milling and pulsed laser deposition and applications of nanomaterials.

Total Periods: 45

TEXT BOOK:

1. P. K. Palaniswamy, *Engineering Physics*, Scitech Publications India Private Limited, 2nd edition, 2009.

REFERENCE BOOKS:

1. Dr. S. Mani Naidu*, Engineering Physics*, Pearson Education, 1st edition, 2013.
2. M.N. Avadhanulu, P.G.Kshirsagar, *A textbook of Engineering Physics*, S.Chand & Company Ltd. Revised edition 2014.
3. K. Thyagarajan*, Engineering Physics-I*, McGraw-Hill Education (India) Pvt. Ltd. 2015.

I B. Tech. – I Semester

(16BT1BS03) MATRICES AND NUMERICAL METHODS

(Common to all Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	*70*	*100*	*3*	*1*	*--*	*3*

PREREQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fundamentals of matrix theory; numerical solutions of equations, curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

CO1. demonstrate basic knowledge in
- Finding the rank of matrices and analyzing them.
- Solving algebraic and transcendental equations by various numerical methods.
- Fitting of various types of curves to the experimental data.
- Estimating the missing data through interpolation methods.
- Identification of errors in the experimental data
- Finding the values of derivatives and integrals through various numerical methods.
- Solving differential equations numerically when analytical methods fail.

CO2. develop skills in analyzing the
- methods of interpolating a given data
- properties of interpolating polynomials and derive conclusions
- properties of curves of best fit to the given data
- algebraic and transcendental equations through their solutions
- properties of functions through numerical differentiation and integration
- properties of numerical solutions of differential equations

CO3. develop skills in designing mathematical models for

- Fitting geometrical curves to the given data
- Solving differential equations
- Constructing polynomials to the given data and drawing inferences.

CO4. develop numerical skills in solving the problems involving
- Systems of linear equations
- Fitting of polynomials and different types of equations to the experimental data
- Derivatives and integrals
- Ordinary differential equations

CO5. use relevant numerical techniques for
- Diagonalising the matrices of quadratic forms
- Interpolation of data and fitting interpolation polynomials
- Fitting of different types of curves to experimental data
- obtaining derivatives of required order for given experimental data
- Expressing the functions as sum of partial fractions

DETAILED SYLLABUS:

UNIT–I: MATRICES (11 periods)

Rank of a matrix, echelon form, normal form, inverse of a matrix by elementary row operations. Solutions of linear system of equations. Eigen values, Eigen vectors and properties (without proof), Diagonalization. Quadratic form (QF), reductions to canonical form using orthogonal transformation and nature of QF.

UNIT-II: NUMERICAL SOLUTIONS OF EQUATIONS AND CURVE FITTING (08 periods)

Solutions of Algebraic and Transcendental equations by bisection method, Regula-Falsi method, Newton – Raphson's method. Curve fitting by the principle of least squares, fitting of a straight line, parabola and exponential curves.

UNIT- III: INTERPOLATION (08 periods)

Interpolation, difference operators and their relationships, Newton's forward and backward formulae, Lagrange's interpolation formula. Partial fractions using Lagrange's interpolation formula.

UNIT-IV: NUMERICAL DIFFERENTIATION AND INTEGRATION (08 periods)

Numerical differentiation using Newton's forward and backward formulae. Numerical integration using Trapezoidal rule, Simpson's $1/3^{rd}$ rule and $3/8^{th}$ rule.

UNIT-V: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS (10 periods)

Numerical solutions of first order Initial value problems using Taylor series method, Euler's method , modified Euler's method, Runge – Kutta method (4^{th}order only) and Milne's predictor – corrector method.

Total no. of periods: 45

TEXT BOOK:

1. T.K.V. Iyenger, B. Krishna Gandhi, S.Ranganadham and M.V.S.S.N.Prasad, *Mathematical Methods,* S.Chand and Company, 8^{th} edition, 2013

REFERENCE BOOKS:

1. B.S. Grewal, *Higher engineering mathematics*, Khanna Publishers, 42^{nd} edition, 2012
2. S.S.Sastry, *Introductory methods of Numerical Analysis*, Prentice Hall of India, 5^{th} edition, 2013.

I B. Tech. - I Semester

(16BT1BS04) MULTI - VARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS

(Common to all Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	*70*	*100*	*3*	*1*	*--*	*3*

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: First order differential equations; higher order linear differential equations; functions of several variables; applications of integration; multiple integrals; vector calculus.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

CO1. demonstrate knowledge in
- Higher order Differential equations
- Maximum and minimum values for the functions of several variables
- Double and triple integrals
- Differentiation and integration of vector functions.
- Line and surface volume transforming integrals from three dimensional surfaces and volumes on to plane surfaces

CO2. develop skills in analyzing the
- methods for differential equation for obtaining appropriate solutions,
- Properties of oscillatory electrical circuits and heat transfer in engineering systems
- The variations in the properties of functions near their stationary values
- Flow patterns of fluids, electrical and magnetic flux and related aspects

CO3. develop skills in designing mathematical models for
- R-C and L-R-C oscillatory electrical circuits
- Heat transfer and Newton's law of cooling
- Engineering concepts involving lengths of curves

and areas of planes, Flux across surfaces

CO4. develop analytical skills in solving the problems involving
- Newton's law of cooling
- non homogeneous linear differential equations
- maximum and minimum values for the functions
- lengths of curves, areas of surfaces and volumes of solids in engineering
- transformation of integrals from three dimensional surfaces and volumes on to plane surfaces

CO5. use relevant mathematical techniques for evaluating
- various types of particular integrals in differential equations
- stationary values for multi variable functions
- multiple integrals in change of variables
- integrations of vector functions.

DETAILED SYLLABUS:

UNIT-I: FIRST ORDER DIFFERENTIAL EQUATIONS (06 periods)

Linear and Bernoulli type, exact equations and reducible to exact. Orthogonal trajectories (Both Cartesian and polar forms). Newton's law of cooling.

UNIT II: HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS (09 periods)

Method for solution of linear equations- Differential operator *D*, Solution of second order linear homogeneous equations with constant coefficients, Solution of Higher order homogeneous linear equations with constant coefficients, **Solution of Non homogeneous linear equations**-Operator methods for finding particular integrals- for cases – e^{ax}, sin ax, cos ax, x^n, e^{ax} V(x), xV(x). Method of Variation of parameters. Applications to oscillatory electrical circuits.

UNIT-III: FUNCTIONS OF SEVERAL VARIABLES (08 periods)

Functions of Two Variables: Limits, Continuity; **Partial Derivatives**: Total Differential and Derivatives, Jacobian, Functional dependence, Taylor's Theorem, maxima and minima of functions of two variables with and without constraints – Lagrange's method of undetermined multipliers.

UNIT-IV: APPLICATIONS OF INTEGRATION AND MULTIPLE INTEGRALS (10 periods)

Applications of integration to – lengths of curves, areas of surfaces of revolution, Double and Triple integrals – change of order of integration, change of variables in integrals. Area enclosed by plane curves, volumes of solids.

UNIT-V: VECTOR CALCULUS (12 periods)

Vector differentiation: Gradient of a scalar field and Directional Derivative, Divergence and Curl of a Vector field

Line integrals: Line integrals independent of path – work done.

Surface area and Surface Integrals: Surface Area, Surface Integrals, Flux across a surface.

Green's Theorem: Green's Theorem (without proof)- verification- applications

Gauss Divergence Theorem and Stoke's Theorem: Gauss Divergence theorem (without proof), Stokes's Theorem (without proof) –verifications and applications.

Total no. of periods: 45

TEXT BOOK:

1. T.K.V. Iyengar, B. Krishna Gandhi, S.Ranganatham and M.V.S.S.N. Prasad, *Engineering Mathematics, Vol-1*, S. Chand & Company, 13th edition, 2014.

REFERENCE BOOKS:

1. Grewal, B.S., *Higher Engineering Mathematics*, Khanna publishers, Delhi, 42nd edition, 2012.
2. Kreyszig, E., *Advanced Engineering Mathematics*, John Wiley and Sons, Inc., 9th edition, 2012.

I B. Tech. - I Semester
(16BT10201) **ELECTRIC CIRCUITS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	*70*	*100*	*4*	*1*	*--*	*4*

PREREQUISITES: Physics at Intermediate Level

COURSE DESCRIPTION:

Fundamentals of electric circuit parameters; nodal and mesh analysis; analysis of single phase and polyphase systems; analysis of coupled circuits; network theorems.

COURSE OUTCOMES:

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

CO1. demonstrate knowledge on
- voltage and current relationships for various electric elements
- network reduction techniques
- concepts of 1-phase and 3-phase electric circuits
- concepts of magnetically coupled circuits
- various circuit theorems

CO2. analyze electric and coupled circuits with conventional concepts and theorems

CO3. design resonant circuits to meet the required specifications

CO4. evaluate electric and magnetically coupled circuits parameters using conventional techniques and theorems.

DETAILED SYLLABUS:

UNIT-I: FUNDAMENTALS OF ELECTRICAL CIRCUITS (13 periods)

Concepts of charge, current, voltage, power and energy; Basic definitions of network, circuit, node, branch and loop; circuit elements – classifications; Ohm's law, Kirchhoff's laws; network reduction techniques-series, parallel, series-parallel circuits, source transformation, wye-to-delta and delta-to-wye transformations; current division and voltage division rules; nodal analysis and super node concept, mesh analysis and super mesh concept – problems.

UNIT-II: SINGLE PHASE AC CIRCUITS (13 periods)

Fundamentals of AC quantities; average and effective values of periodic waveforms; representation of electrical quantities in sinusoids and phasors, phasor relationships for circuit elements; impedance and admittance, impedance triangle; instantaneous and average power, power triangle; Sinusoidal response of R, L and C elements with different combinations; current locus; Resonance, bandwidth and quality factor for series and parallel networks – problems.

UNIT-III: CIRCUIT THEOREMS (10 periods)

Superposition, Thevenin's, Norton's, Maximum power transfer, Millmann's, Reciprocity and Compensation, Tellegen's theorems for DC & AC Excitations (without proof) – problems. Concept of dual and duality.

UNIT-IV: THREE PHASE AC CIRCUITS (11 periods)

Introduction to polyphase system and its advantages; phase sequence; analysis of three phase balanced and unbalanced systems; measurement of active and reactive power in balanced and unbalanced systems – problems.

UNIT-V: MAGNETICALLY COUPLED CIRCUITS (08 periods)

Coupled circuits-self and mutual inductance, coefficient of coupling, DOT convention; series and parallel connection of coupled coils, equivalent circuits of coupled coils; energy in coupled circuit; analogy between electrical and magnetic circuits – problems.

Total Periods: 55

TEXT BOOKS:

1. Charles K. Alexander, Mathew N O Sadiku, *Fundamentals of Electric Circuits*, McGraw hill education(India) Pvt. Ltd, New Delhi, 5th edition, 2013.
2. A. Sudhakar, Shyammohan S Palli, Circuits and Networks Analysis and Synthesis, Mc Graw Hill company, New Delhi 5th edition, 2015.

REFERENCE BOOKS:

1. J.A.Edminister, M.D.Nahvi, *Theory and Problems of Electric Circuits*, Schaum's outline series, Tata McGraw Hill Company, New Delhi, 4th edition, 2004.
2. W H Hayt, J E Kemmerly, S M Durbin, *Engineering Circuit Analysis*, Tata Mc Graw Hill publishing company Ltd., New Delhi, 6th edition, 2008.

I B. Tech. - I Semester

(16BT10501) **PROGRAMMING IN C**

(Common to all Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	*70*	*100*	*3*	*1*	*-*	*3*

PREREQUISITES: --

COURSE DESCRIPTION:

Program design; Operators and Expressions; Data Input and Output; Control Statements; Functions; Arrays; Strings; Pointers; Structures & Unions and File handling Techniques;

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1. demonstrate knowledge in:
- Elements of C Language
- Selection and Repetition statements.
- Arrays, Strings and Functional statements.
- Derived data types, Files and Pointers

CO2. analyze complex engineering problems to develop suitable solutions

CO3. design algorithms for specified engineering problems

CO4. use appropriate 'C' language constructs for solving engineering problems

CO5. write programs using 'C' language to implement algorithms

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO C PROGRAMMING, OPERATORS & EXPRESSIONS (08 periods)

Introduction to C Programming: The C Character set, Writing First Program of C, Identifiers and Keywords, Data types, Constants, Variables and Arrays, Declarations, Expressions, Statements and Symbolic Constants.

Operators and Expressions: Arithmetic Operators, Unary Operators, Relational and Logical Operators, Assignment Operators, the Conditional Operators.

UNIT-II: DATA INPUT AND OUTPUT & CONTROL STATEMENTS (08 periods)

Data Input and Output: Single Character Input and Output,

Input Data & Output data, The gets and puts Function.

Control Statements: Branching: The if-else Statement, Looping: The while Statement, More Looping: The do-while Statement, Still More Looping: The for Statement, Nested Control Statement, The switch Statement, The break & continue Statements, The goto Statement.

UNIT-III: FUNCTIONS, PROGRAM STRUCTURES & ARRAYS (11 p*eriods*)

Functions: A Brief Overview, Defining a Function, Accessing a Function, Function Prototypes, Parsing Argument to a Function, Recursion.

Program Structure: Storage Classes, Automatic Variables, External (Global) Variables, Static Variables, Multi file Programs,

Arrays: Defining an Array, Processing an Array, Processing Array to function, Multidimensional Arrays. Linear search, Binary search, Fibonacci search, Bubble sort and Insertion sort

UNIT-IV: STRINGS & POINTERS (09 periods)

Strings: Defining a String, NULL Character, Initialization of Strings, Reading and Writing a String, Processing a Strings, Character Arithmetic, Searching and Sorting of Strings, Library Functions for Strings.

Pointers: Pointer Declaration, Passing Pointers to a Function, Pointers and One-dimensional Arrays, Dynamic Memory Allocation, Operations on Pointers, Pointers and Multidimensional Arrays, Arrays of Pointers.

UNIT-V: STRUCTURES AND UNIONS & FILE HANDLING (09 periods)

Structures and Unions: Defining a Structure, Processing a Structure, User-Defined Data types (typedef), Structures and Pointers, Passing Structures to Function, Self –Referential Structures, Unions

File Handling: Files introduction, Opening and Closing a Data File, Reading and Writing a Data File, Processing a Data File, Unformatted Data File, Concept of Binary Files, Accessing the File Randomly.

Total Periods: *45*

TEXT BOOK:

1. Byron Gottfried and Jitender Kumar C *Programming with C*, Third Edition, McGraw Hill Education (India) Pvt, Ltd, New Delhi, 2016.

REFERENCE BOOKS:

1. Pradip Dey and Manas Ghosh, *Programming in C,* Second Edition, Oxford University Press, NewDelhi, 2007.
2. E. Balagurusamy, *Programming in C,* Seventh Edition, Mc Graw Hill Education (India) Pvt, Ltd, New Delhi, 2014.

I B. Tech. - I Semester

(16BT1BS32) **ENGINEERING PHYSICS LAB**

(Common to ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	*50*	*100*	*-*	*-*	*3*	*2*

PREREQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and A.C source using A.C sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. demonstrate basic knowledge about semiconductor materials, magnetic materials and lasers.

CO2.demonstrate analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.

CO3.develop skills in designing electronic circuits using semiconductor components.

CO4. use instrumental techniques in A.C sonometer and Melde's experiment.

CO5.apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

ENGINEERING PHYSICS LAB

Conduct a minimum of any **Ten** of the following experiments.

1. Determination of wavelength of a laser source using Diffraction Grating.
2. Determination of particle size by using a laser source.
3. Determination of Numerical aperture and acceptance angle of an optical fiber.

4. Melde’s experiment - transverse & longitudinal modes.
5. Magnetic field along the axis of a current carrying coil- Stewart and Gee’s method.
6. Calculation of A.C frequency using sonometer.
7. I-V Characteristics of a p-n Junction diode.
8. Energy gap of a material of a p-n Junction.
9. Characteristics of LED source.
10. Characteristics of Photo diode.
11. Hall Effect.
12. Determination of rigidity modulus of the material of the wire using torsional pendulum.

I B. Tech. - I Semester
(16BT10231) **ELECTRIC CIRCUITS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	*50*	*100*	*-*	*-*	*3*	*2*

PREREQUISITES: -

COURSE DESCRIPTION:

Verification of Ohm's law, KVL, KCL and network theorems; analysis of AC and DC circuits; determination of resonant frequency in series and parallel RLC circuits; determination of self and mutual inductances in coupled circuits;

COURSE OUTCOMES:

After successful completion of the course, student will be able to:

CO1. demonstrate knowledge on
- identification of various circuit elements and their values.
- concepts of electrical and magnetic circuits.

CO2. analyze and relate physical observations and measurements in electric circuits to theoretical principles and theorems.

CO3. design circuit parameters to meet the required specifications

CO4. demonstrate skills in
- obtaining the current locus diagrams.
- determining the parameters of magnetically coupled circuits.
- measuring of active and reactive powers.

CO5. function effectively as an individual and as a member in a team

CO6. communicate effectively both oral and prepare laboratory reports.

DETAILED SYLLABUS:

LIST OF EXPERIMENTS:

1. Verification of Ohm's Law and Kirchhoff's Laws
2. Variation of Resistance of Conductor with temperature
3. Phasor analysis of RL, RC and RLC circuits
4. Analyzing the series RL, RC and RLC circuits for various excitation systems

5. Current locus diagram of RL and RC series circuits
6. Series and Parallel resonance
7. Verification of Superposition and Reciprocity theorems
8. Verification of Thevenin's and Norton's theorem
9. Verification of Millmann's and Compensation theorems
10. Verification of Maximum Power transfer theorem for DC & AC excitations
11. Measurement of active and reactive power in three phase circuits
12. Determination of self and mutual inductance and coefficient of coupling
13. Determination of equivalent inductance for aiding and opposing fluxes.

I B. Tech. - I Semester

(16BT10232) ELECTRICAL AND ELECTRONICS WORKSHOP PRACTICE

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	*50*	*100*	*0*	*0*	*3*	*2*

PREREQUISITES: --

COURSE DESCRIPTION: Identification and specifications of various Electric and Electronic devices; analysis of various series, parallel and series-parallel electrical circuits; develop various electrical circuits for domestic and industrial applications.

COURSE OUTCOMES: After successful completion of the course, student will be able to

CO1. demonstrate knowledge on various Electrical and Electronic Devices.
CO2. analyze various series and parallel electrical circuits.
CO3. design and develop various electrical circuits for domestic and industrial applications.
CO4. function effectively as individual and as a member in a team.
CO5. communicate effectively both oral and written forms

DETAILED SYLLABUS:

PART A: (Demonstration)

1. Identification and Specifications of R, L, C Components (Colour Codes), Potentiometers, Switches (SPST, DPST and DPI), Gang Condensers, Relays, Bread Boards, PCBs, Fuses, MCBs, Earthing and Electrical Wiring accessories.
2. Identification and Specifications of Active Devices: Diodes, BJTs, Low-power JFETs, MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT, DIACs, TRIACs, Linear and Digital ICs.
3. Study the operation of
   - Multimeter (Analog and Digital)
   - Function Generator
   - Regulated Power Supplies
   - CRO.

PART-B:

1. Measurement of Electrical Quantities (AC & DC) using: Voltmeter, Ammeter and Wattmeter.
2. Measurement of Resistivity of a conducting wire.
3. Circuit with one lamp controlled by one switch and provision of 2-pin or 3-pin socket PVC surface conduit system.
4. Circuit with two lamps controlled by two switches with PVC surface conduit system.
5. Circuit for Stair case wiring and Godown wiring.
6. Circuit connection for a Fluorescent tube
7. Solder simple electronic circuits.
8. B-H curve of a Magnetic material
9. I-V and P-V characteristics of a Solar panel
10. Design and Fabrication of a single-phase transformer
11. PCB preparation and design of a circuit on a PCB

I B. Tech. - I Semester
(16BT10531) **PROGRAMMING IN C LAB**
(Common to all Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	*50*	*100*	*-*	*-*	*3*	*2*

PREREQUISITES:-

A course on Programming in C

COURSE DESCRIPTION:

Hands on practice in developing and executing simple programs using C Programming constructs– Conditional statements, Loops, Arrays, Strings, Functions, Structures, Pointers and Functions.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. demonstrate practical knowledge of using C language constructs:
- Selection and Repetition statements.
- Arrays, Strings and Functional statements.
- Derived data types, Files and Pointers

CO2. analyze problems to develop suitable algorithmic solutions

CO3. design Solutions for specified engineering problems

CO4. use appropriate 'C' language constructs for solving engineering problems

CO5. implement and execute programs using 'C' language

CO6. document programs and communicate effectively while conducting Professional transactions.

List of Exercises:

1. a. Let a and b are two integer variables whose values are 10 and 13 respectively. Write a program to evaluate the following arithmetic expressions.
   i) a + b ii) a–b iii) a * b iv) a/b v) a % b

   b. Write a program to evaluate the following algebraic expressions after reading necessary values from keyword.
   i) $(ax + b)/(ax - b)$
   ii) $2.5 \log x + \text{Cos } 32^0 + | x^2 + y^2|$
   iii) $x^5 + 10\,x^4 + 8$ and $x^3 + 4\,x + 2$
   iv) ae^{kt}

2. a. Mr. Gupta deposited Rs.1000 in a bank. The bank gives simple interest at the rate of 15% per annum. Write a program to determine the amount in Mr. Gupta's account at the end of 5 years. (Use the formula I = P T R / 100)

b. A cashier has currency notes of denominations Rs.10, Rs. 50 and Rs. 100. If the amount to be withdrawn is input in hundreds, find the total number of notes of each denomination the cashier will have to give to the withdrawer.

c. In a town, the percentage of men is 52. The percentage of total literacy is 48.If total percentage of literate men is 35 of the total population; write a program to find the total number of illiterate men and women if the population of the town is 8000.

3. a. Write a program that prints the given 3 integers in ascending order using if - else.

b. Write a program to calculate commission for the input value of sales amount.
Commission is calculated as per the following rules:
i) Commission is NIL for sales amount Rs. 5000.
ii) Commission is 2% for sales when sales amount is >Rs. 5000 and <= Rs. 10000.
iii) Commission is 5% for sales amount >Rs. 10000.

c. A character is entered through keyboard. Write a program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol. The following table shows the range of ASCII values for various characters.

Characters	**ASCII values**
A - Z	65 - 90
a - z	97- 122
0 - 9	48 - 57
Special Symbols	0 - 47, 58 - 64, 91- 96, 123 - 127

4. a. If cost price and selling price of an item is input through the keyboard, write program to determine whether the seller has made profit or incurred loss. Also determine how much profit or loss he incurred in percentage.

b. An insurance company calculates premium as follows:

i. If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city and is a male then premium is Rs.4 per thousand and the policy amount cannot exceed Rs.2 lakhs.

ii. If a person satisfies all the above conditions and is female then the premium is Rs.3 per thousand and the policy amount cannot exceed Rs.1 lakh.

iii. If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then premium is Rs.6 per thousand and the policy cannot exceed Rs. 10000.

iv. In all other cases the person is not insured.

Write a program to determine whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.

5. a. Write a program, which takes two integer operands and one operator as input from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, %. Use switch statement)

b. Write a program to find the grace marks for a student using switch. The user should enter the class obtained by the student and the number of subjects he has failed in. Use the following rules:

i. If the student gets first class and the number of subjects failed is >3, then no grace marks are awarded. If the number of subjects failed is less than or equal to '3' then the grace is 5 marks per subject.

ii. If the student gets second class and the number of subjects failed in is >2, then no grace marks are awarded. If the number of subjects failed in less than or equal to '3' then the grace is 4 marks per subject.

iii. If the student gets third class and the number of subjects failed in is >1, then no grace marks are awarded. If the number of subjects failed in is equal to '1' then the grace is 5 marks per subject.

6. a. Write a program to find the sum of individual digits of a positive integer.

b. A Fibonacci sequence is defined as follows:

The first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a program to generate the first N terms of the sequence.

Write a program to generate all the prime numbers between 1 and N, where N is a value supplied by the user.

7. a. Write a program to find the largest and smallest number in a given list of integers.

b. Write a program to perform the following:

i. Addition of two matrices.

ii. Multiplication of two matrices.

8. a. Write a program that uses functions to perform the following operations:
   i. To insert a sub-string in main string at a specified position.
   ii. To delete N characters from a given string from a specified position.
   b. Write a program to determine whether the given string is palindrome or not.
   c. Write a program to display the position or index in the main string S where the sub string T begins. Display -1 if S does not contain T.
   d. Write a program to count the number of lines, words and characters in a given text.
9. a. Write a program to read list of student names and perform the following operations using functions.
   i. to print list of names
   ii. to sort them in ascending order
   iii. to print the list after sorting.
   b. Write a menu driven program to read list of student names and perform the following operations using array of character pointers.
   i. to insert a student name
   ii. to delete a name
   iii. to print the name
10. Write a program that uses functions to perform the following operations:
   i. Reading a complex number
   ii. Writing a complex number
   iii. Addition of two complex numbers
   iv. Multiplication of two complex numbers
   (**Note:** Represent complex number using a structure.)
11. a. Write a program to accept the elements of the structure as:
   Employee-name,Basic pay
   Display the same structure along with the DA, CCA and Gross salary for 5 employees.
   Note: DA=51% of Basic pay, CCA=Rs.100.consolidated.
   b. Define a structure to store employee's data with the following specifications:
   Employee-Number, Employee-Name, Basic pay, Date of Joining
   i. Write a function to store 10 employee details.
   ii. Write a function to implement the following rules while revising the basic pay.

If Basic pay<=Rs.5000 then increase it by 15%.
If Basic pay> Rs.5000 and <=Rs.25000 then it increase by 10%.
If Basic pay>Rs.25000 then there is no change in basic pay.
Write a function to print the details of employees who have completed 20 years of service from the date of joining.

12. a. Write a program which copies one 'text file' to another 'text file'.
    b. Write a program to reverse the first N characters of a given text file.

Note: The file name and N are specified through command line.

13. Write a program to print the output by giving the Customer_ID as an input.

REFERENCE BOOKS:

1. Byron Gottfried and Jitender Kumar C, *Programming with C*, 3rd edition, McGraw Hill Education(India) Pvt. ltd, New Delhi, 2016.
2. Pradip Dey and Manas Ghosh, *Programming in C*, 2nd edition, Oxford University Press, New Delhi, 2007.

I B. Tech. - II Semester

(16BT1HS01) **Technical English**

(Common to ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: English at Intermediate level

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OUTCOMES:

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

CO1. demonstrate knowledge in
- Process of communication
- Modes of listening
- Paralinguistic features
- Skimming and Scanning
- Elements of style in writing

CO2. analyze the possibilities and limitations of language for understanding
- Barriers to Communication
- Barriers to Effective Listening
- Barriers to Speaking
- Formal and metaphorical language

CO3. design and develop functional skills for professional practice.

CO4. apply writing skills in preparing and presenting documents

CO5. function effectively as an individual and as a member in diverse teams.

CO6. communicate effectively with the engineering community and society in formal and informal situations.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO COMMUNICATION (09 periods)

Introduction -Language as a Tool of Communication - Communicative Skills (Listening, Speaking, Reading and Writing) - Effective Communication - Modes of Communication - Barriers to Communication (classification).

UNIT-II: ACTIVE LISTENING (09 periods)

Introduction - Reasons for poor Listening - Traits of a Good Listener - Listening Modes - Types of Listening - Barriers to Effective Listening - Listening for General Content and Specific Information.

UNIT-III: EFFECTIVE SPEAKING (09 periods)

Introduction - Achieving Confidence, Clarity and Fluency - Paralinguistic Features - Barriers to Speaking - Types of Speaking - Persuasive Speaking.

UNIT-IV: READING (09 periods)

Introduction and Reading Rates - Reading and Interpretation - Intensive and Extensive Reading - Critical Reading - Reading for Different Purposes - SQ3R Reading Technique -Study Skills.

UNIT-V: WRITING (09 periods)

Introduction - Language - Elements of Style - Techniques for Good Technical Writing - Referencing and Styling - Right Words and Phrases - Sentences.

Total Periods: 45

TEXT BOOKS:

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2012.

REFERENCE BOOKS:

1. Ashraf Rizvi, *Effective Technical Communication*, McGraw-Hill Education (India) Pvt.Ltd., New Delhi, 2015.
2. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, New Delhi, 2013.
3. Teri Kwal Gamble and Michael Gamble, *Communication Works*, Tata Mc Graw-Hill, New Delhi, 2010.
4. Rajendra Pal and J.S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Sons (P) Ltd., New Delhi, 2010.

I B. Tech - II Semester
(16BT1BS01): **ENGINEERING CHEMISTRY**
(Common to ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nanochemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.

CO2. develop analytical skills in:
- Determination of hardness of water.
- Determination of viscosity, flame and fire points, cloud and pour points.

CO3. develop designing skills in:
- Synthesis of engineering plastics.
- Chemical methods for the synthesis of Nano materials.

CO4. develop skills for providing solutions through:
- Mitigation of hardness of water.
- Newer Nanomaterials and engineering plastics for specific applications

CO5. acquire awareness to practice engineering in compliance to modern techniques such as:
- Nalgonda technique for defluoridation of water
- Electroplating technique for control of corrosion.

CO6. acquire awareness to societal issues on:
- Quality of water.
- Bio-diesel
- Chemical materials utility and their impact.

DETAILED SYLLABUS:

UNIT–I: WATER TECHNOLOGY (09 periods)

Introduction: Types of water, impurities in water and their consequences, types of hardness of water, units of hardness of water, disadvantages of hardness of water, estimation of hardness of water by EDTA method, Boiler troubles: Scales and Sludges, Caustic embrittlement, Boiler corrosion and Priming and Foaming.

Softening of water: Zeolite process and Ion exchange process, advantages and disadvantages. Desalination of brackish water by Reverse Osmosis, Numerical problems on estimation of hardness of water.

Fluorides in water: Effects on human health, defluoridation method-Nalgonda method; comparison of merits and demerits of various defluoridation methods (Nalgonda, Bone Charcoal, Activated Alumina, Contact precipitation, Brick, Reverse osmosis).

UNIT-II: CHEMISTRY OF ENGINEERING MATERIALS (09 periods)

Engineering Plastics: Definition, general properties, synthesis, properties and applications of PC, PTFE, and PMMA.

Conducting polymers: Definition, types of conducting polymers: Intrinsic and extrinsic conducting polymers with examples, engineering applications of conducting polymers.

Biodegradable polymers: Definition, properties, classification, mechanism of degradation of biodegradable polymers and their applications.

Composites – Introduction, types of composites: fiber reinforced particulate and layered composites with examples, advantages of composites and applications.

UNIT-III: NANOCHEMISTRY AND GREEN CHEMISTRY (09 periods)

Nanochemistry: Introduction, classification, properties and applications of Nano materials (nano particles, nano tubes, nano wires, nano composites, dendrimers); synthesis of Nano materials – Sol-gel process.

Green Chemistry: Introduction, principles of green chemistry, Tools of Green Chemistry with Examples, Applications of Green Chemistry in science and technology.

Biodiesel: Introduction, Synthesis (Trans esterification method),

advantages, disadvantages and applications.

UNIT-IV: ELECTROCHEMICAL CELLS AND SENSORS (09 periods)

Electrochemical cell: Introduction, EMF of an electrochemical cell.

Batteries: Introduction, types of Batteries: primary and secondary batteries with examples, Ni-Cd batteries, Lithium-ion batteries, Lithium- Polymer batteries, Applications of batteries.

Fuel Cells: Definition, examples: $H_2 - O_2$ Fuel cell, solid oxide fuel cell, Bio-fuel cell and applications of fuel cells.

Sensors - Introduction, Types of Sensors, electrochemical sensor: construction and working principle of potentiometric sensor, and applications of electrochemical sensors.

UNIT-V: CORROSION AND LUBRICANTS (09 periods)

Corrosion: Introduction, Definition, types of corrosion (dry and wet corrosion), galvanic corrosion, concentration cell corrosion, Factors influencing corrosion, Corrosion control: cathodic protection; sacrificial anodic protection and impressed current cathodic protection; protective coatings: Galvanizing and Electroplating (Nickel).

Lubricants: Definition, functions of lubricants, mechanism of lubrication, classification of lubricants, properties of lubricants – viscosity, flash and fire points, cloud and pour points, Aniline points, neutralization number and mechanical strength.

Total periods: 45

TEXT BOOKS:

1. P.C.Jain & Monika Jain*, Engineering Chemistry*, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy & C. Ramachandraiah *Engineering Chemistry,* Mc. Graw-Hill Higher Education, Hyderabad, 1st edition, 2015.

REFERENCE BOOKS:

1. A.K. Bandyopadhyay, *Nano Materials,* New Age international publishers, 2nd edition, 2014.
2. Paul T. Anastas and John C Warner, *Green Chemistry: Theory and practice,* Oxford University Press, 2000.

I B. Tech. - II Semester

(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to all Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	–	3

PREREQUISITES: Intermediate /Senior secondary Mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z –transforms; partial differential equations.

COURSE OUTCOMES:

On successful completion of this course, students will be able to

CO1. demonstrate basic knowledge in
- Fourier series and Fourier transforms
- Fourier integrals
- Laplace transforms and their applications
- z- transforms and their applications
- solving partial differential equations

CO2. analyze
- Properties of Fourier series for a given function
- Partial differential equations through different evaluation methods
- Difference equations through z – transforms
- Engineering systems and processes involving wave forms and heat transfer

CO3. design mathematical models for
- Problems involving heat transfer and wave forms
- Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations

CO4. solve problems involving
- Fourier series and Fourier transforms
- Laplace transforms
- Z-transforms and difference equations
- Heat transfer and wave motion

CO5. use relevant transformation techniques for
- Obtaining Fourier transforms for different types of functions
- Laplace transforms

- Z- transforms
- Partial differential equations

DETAILED SYLLABUS:

UNIT-I: FOURIER SERIES (07 periods)

Fourier series: Determination of Fourier coefficients, convergence of Fourier series (Dirichlet's conditions), Fourier series of even and odd functions, Half-range Fourier sine and cosine expansions.

UNIT-II: FOURIER INTEGRALS AND FOURIER TRANSFORMS (08 periods)

Fourier integral theorem (statement only), Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms –properties, Inverse transform and finite Fourier transforms.

UNIT-III: LAPLACE TRANSFORMS (12 periods)

Laplace transforms of standard functions. Properties of Laplace transforms. First and second shifting Theorems. Laplace transforms of derivatives and integrals. Inverse transforms. Convolution theorem (without proof), inverse Laplace transforms by convolution theorem. Laplace transform of periodic functions, Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT-IV: Z- TRANSFORMS (09 periods)

Z – transforms, inverse Z– transforms, damping rule, shifting rule, initial and final value theorems. Convolution theorem (without proof), solution of difference equations by Z–transforms.

UNIT-V: PARTIAL DIFFERENTIAL EQUATIONS (09 periods)

Formation of Partial differential equations – Solutions of first order linear equations by method of grouping. First and second order equations by method of separation of variables – Solutions of one dimensional Wave equation, Heat equation.

Total no. of periods: 45

TEXT BOOKS:

1. T.K.V. Iyengar, B. Krishna Gandhi, S.Ranganadham and M.V.S.S.N. Prasad, *Engineering Mathematics, vol-1*, S. Chand & Company 13th edition, 2014.
2. T.K.V. Iyenger, B. Krishna Gandhi, S. Ranganadham and M.V.S.S.N.Prasad, *Mathematical Methods,* S. Chand and Company, 8th edition, 2013.

REFERENCE BOOKS:

1. Grewal, B.S., *Higher Engineering Mathematics*, Khanna publishers, Delhi, 42nd edition, 2012.
2. Kreyszig, E., *Advanced Engineering Mathematics*, John Wiley and Sons, Inc., 9th edition, 2013.

I B. Tech. - II Semester

(16BT20401) ELECTRONIC DEVICES AND CIRCUITS

(Common to ECE, EIE & EEE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: A Course on Engineering Physics.

COURSE DESCRIPTION:

Characteristics of general and special purpose electronic devices; Rectifiers; filters and regulators; Biasing and small signal analysis of BJT and FET.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. demonstrate knowledge in
- p-n junction diode and its characteristics
- Zener diode and its characteristics
- Rectifiers, Filters and Regulators
- Characteristics of BJT, FET, MOSFET and special purpose electronic devices.

CO2. analyze numerical and analytical problems in
- Rectifiers using Filters
- Regulated Power Supplies
- Transistor biasing circuits and stabilization
- Transistor amplifiers
- FET biasing circuits and amplifiers

CO3. design electronic circuits such as
- Rectifiers with and without filters
- Voltage regulators
- BJT and FET biasing circuits
- BJT and FET amplifiers

CO4. solve engineering problems and arrive at solutions pertaining to electronic circuits.

CO5. select appropriate technique for transistor modeling.

DETAILED SYLLABUS:

UNIT-I: P-N JUNCTION DIODE, RECTIFIERS AND REGULATORS (11 Periods)

P-N Junction Diode:

p-n Junction as a diode, *p-n* Junction diode equation, Volt-Ampere (V-I) characteristics, temperature dependence of *p-n* characteristics, diode resistance-static and dynamic resistances, transition and diffusion capacitances, break down mechanisms in semiconductor diodes, Zener diode characteristics.

Rectifiers and Regulators:

Half-Wave rectifier and Full-Wave rectifiers (Qualitative and quantitative analysis), Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L - section filter, ð- section filter, comparison of various filter circuits in terms of ripple factors. Simple circuit of a regulator using Zener diode. Problems on rectifier circuits.

UNIT-II: BIPOLAR JUNCTION TRANSISTOR, BIASING AND STABILIZATION (10 Periods)

Transistor construction, BJT Operation, Transistor currents and their relations, Input and Output Characteristics of a Transistor in Common Emitter, Common Base and Common Collector Configurations, BJT specifications, Transistor Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Emitter Feedback Bias, Collector to Base Feedback Bias, Voltage Divider Bias, Bias Stability, Transistor as an amplifier, Thermal Runaway, Problems on biasing circuits.

UNIT-III: SMALL SIGNAL ANALYSIS OF BJT AMPLIFIERS (08 Periods)

BJT Modeling, Hybrid Modeling, Determination of h-Parameters from Transistor Characteristics, Measurement of h-Parameters, Miller's Theorem, Analysis of CE, CB and CC configurations using simplified Hybrid Model, Comparison of CB, CE and CC configurations.

UNIT-IV: FIELD EFFECT TRANSISTORS (10 Periods)

Construction, Principle of operation and characteristics of JFET and MOSFET (Enhancement & Depletion), Biasing of FET, Small Signal Model of JFET, Common Source and Common Drain Amplifiers using JFET, Generalized FET Amplifier, FET as Voltage Variable Resistor, Comparison of BJT and FET.

UNIT-V: SPECIAL PURPOSE ELECTRONIC DEVICES

(06 Periods)

Principle of Operation and Characteristics of Tunnel Diode, Uni-Junction Transistor (UJT), Varactor Diode, Silicon Control Rectifier (SCR). Principle of operation of Schottky Barrier Diode.

Total Periods: *45*

TEXT BOOK:

1. J. Millman, Christos C. Halkias and SatyabrataJit, *Electronic Devices and Circuits,* TMH, 3rd edition, 2010.

REFERENCE BOOKS:

1. R.L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuits,* PHI, 10th edition, 2009.
2. David A. Bell, *Electronic Devices and Circuits,* Oxford University press, 5th edition, 2014.
3. S. Salivahanan, N. Suresh Kumar, *Electronic Devices and Circuits*, Mc-Graw Hill, 3rd edition 2013.
4. Ben G. Streetman, Sanjay Banerjee, Solid State Electronic Devices, Pearson Prentice Hall, 2006.

I B. Tech. - II-Semester

(16BT20541) **Foundations of Data Structures**

(Common to ECE, EEE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	*70*	*100*	*3*	*1*	*-*	*3*

PREREQUISITES: A course on Programming in C

COURSE DESCRIPTION:

Concepts of sorting: sorting by exchange, sorting by distribution, sorting by merging and data structures: stacks, queues, linked lists, trees, graphs, and hash table.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. demonstrate knowledge in Sorting techniques, Linear and Non-linear Data Structures.
CO2. analyze the performance of sorting techniques and their relationship to Data Structures.
CO3. design appropriate hashing function for a given application and develop programs to implement Linear and Non-Linear data structures
CO4. apply appropriate data structure to provide solutions for real time problems using C Language.

DETAILED SYLLABUS:

UNIT-I: SORTING (09 periods)

SORTING - Sorting by Exchange-Shell Sort, Quick sort. Sorting By Distribution-Counting Sort, Bucket Sort, Radix Sort. Sorting By Merging-Merge Sort.

UNIT-II: STACKS AND QUEUES (09 periods)

STACKS -Introduction, Stack Operations, Applications.
QUEUES - Introduction, Operations on Queues, Circular Queues and Applications.

UNIT-III: LINKED LISTS (09 periods)

LINKED LISTS –Introduction, Single Linked List, Circular Linked List, Doubly Linked List, Multiply Linked List and Applications.
LINKED STACKS AND LINKED QUEUES - Introduction, Operations on Linked Stack and Linked Queues, Dynamic

Memory Management and Linked Stacks.

UNIT-IV: TREES AND BINARY TREES (09 periods)

TREES– Introduction, Definition and Basic Terminologies, Representation of Trees.

BINARY TREES – Basic Terminologies and Types, Representation of Binary Trees, Binary Tree Traversals, Binary Search Trees: Definition and Operations and Applications.

UNIT-V: Graphs and Hashing (09 periods)

Graphs – Introduction, Definitions and Basic Terminologies, Representation of Graphs, Graph Traversals, Applications.

Hashing – Introduction, Hash Table Structure, Hash Functions, Linear Open Addressing, Chaining and Applications.

Total Periods: *45*

TEXT BOOK:

1. G.A.V. Pai, *Data Structures and Algorithms,* Tata McGraw Hill, Second Edition, 2009.

REFERENCE BOOK:

1. Debasis Samanta, *Classic Data Structures*, PHI Learning, Second Edition, 2009.

I B. Tech. - II Semester
(16BT1HS31) **ENGLISH LANGUAGE LAB**
(Common to ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	*50*	*100*	*-*	*-*	*3*	*2*

PREREQUISITES: English at intermediate or equivalent level.

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES:

On successful completion of this course the students will be able to:

CO1. demonstrate knowledge in
- Phonetics
- Information Transfer

CO2. analyze the situations in professional context by using
- Vocabulary
- Grammar

CO3. design and develop functional skills for professional practice.

CO4. apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.

CO5. function effectively as an individual and as a member in diverse teams through
- Extempore talk and
- Role Play

CO6. communicate effectively in public speaking in formal and informal situations.

CO7. recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

LIST OF EXERCISES:

1. Phonetics
2. Vocabulary Building
3. Functional Grammar
4. Just a Minute
5. Elocution/Impromptu
6. Giving Directions/Conversation Starters
7. Role Play
8. Public Speaking
9. Describing People, Places, Objects and Events.
10. Reading Comprehension

11. Listening Comprehension
12. Information Transfer

Total Lab Slots: 10

TEXT BOOK:

1. Department Lab Manual

REFERENCE BOOKS:

1. D. Sudha Rani, *A Manual for English Language Laboratories*, Pearson Education.
2. D. Sudha Rani, *Advanced Communication Skills Laboratory Manual*, Pearson Education.
3. R. Manivannan and G. Immanuel, *Communication Skills Laboratory*, VK Publications, Sivakasi, 2013
4. Nira Kumar*, English Language Laboratories*, PHI Learning Pvt. Ltd., New Delhi, 2011.

SUGGESTED SOFTWARE:

1. ETNL Language Lab Software Version 4.0
2. GEMS - Globarena E- Mentoring System.
3. Speech Solutions.
4. English Pronunciation Dictionary by Daniel Jones.
5. Learn to Speak English 8.1, The Learning Company - 4 CDs.
6. Mastering English: Grammar, Punctuation and Composition.
7. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
8. Dorling Kindersley Series - Grammar.
9. Language in Use 1, 2 & 3.
10. Cambridge Advanced Learner's Dictionary - 3rd Edition.
11. Centronix - Phonetics.
12. Let's Talk English, Regional Institute of English South India.
13. The Ultimate English Tutor.

SUGGESTED SOFTWARE:

S1. ETNL Language Lab Software Version 4.0
S2. GEMS - Globarena E- Mentoring System
S3. Speech Solutions
S4. English Pronunciation Dictionary by Daniel Jones
S5. Learning to Speak English 8.1, The Learning Company - 4 CDs.
S6. Mastering English: Grammar, Punctuation and Composition.
S7. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
S8. Dorling Kindersley Series of Grammar.
S9. Language in Use 1, 2 & 3
S10. Cambridge Advanced Learner's Dictionary - 3rd Edition
S11. Centronix - Phonetics
S12. Let's Talk English, Regional Institute of English South India.
S13. The Ultimate English Tutor

I B. Tech- II Semester

(16BT1BS31): **ENGINEERING CHEMISTRY LAB**

(Common to ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of P^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, P^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

CO1. Acquire basic Knowledge about the volumetric analysis and synthesis of materials used for engineering applications.

CO2. Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.

CO3. Develop designing skills for the synthesis of polymers and Nanomaterials.

CO4. Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, PH of a solution, determination of viscosity of lubricants and estimation of iron in cement.

CO5. Provide solutions for environmental issues through determination of quality of water.

List of Experiments:

A minimum of any **Ten** experiments are to be conducted among the following:.

1. Estimation of Hardness of water by EDTA method.
2. Estimation of alkalinity of Water.
3. Estimation of Dissolved Oxygen in water.
4. Estimation of Ferrous Iron by Dichrometry.
5. Preparation of Novalac Resin.
6. Synthesis of Nano metal-oxide using sol– gel process.
7. Conductometric titration of strong acid Vs strong base
8. Estimation of Ferrous ion by Potentiometry.
9. Determination of amount of corrosion of metals in different medium
10. Measurement of viscosity of lubricants by Ostwald viscometer.
11. Determination of P^H of a given solution by P^H metry.
12. Estimation of Ferric iron in cement by Colorimetric method.

Total Time Slots: 12

I B. Tech. - II Semester

(16BT10331) COMPUTER AIDED ENGINEERING DRAWING

(Common to ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	*50*	*100*	*--*	*1*	*6*	*3*

PREREQUISITES: --

COURSE DESCRIPTION:

Engineering drawing conventions; importance of engineering drawing; fundamental concepts of sketching; computed aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES:

On Successful completion of this course, students will be able to:

CO1. understand, write and read the language of engineering drawing in industry through International System of Standards.
CO2. develop the imagination and mental visualization ability for interpreting the geometrical details of engineering objects.
CO3. produce different views and projection in drawing.
CO4. Use modern CAD software for design and drafting of drawings.
CO5. create multi-view drawings suitable for presentation to Engineering community.
CO6. introduce and communicate universally accepted conventions and symbols for their usage in technical drawing.

DETAILED SYLLABUS:

UNIT-I: BASICS OF ENGINEERING DRAWING PRACTICE, GEOMETRICAL CONSTRUCTIONS, CONICS AND SPECIAL CURVES (18 periods)

Introduction, drawing instruments and its uses, sheet layout, BIS conventions, lines, lettering and dimensioning practices. Geometrical constructions: Construction of regular polygons: Pentagon, Hexagon, Heptagon and Octagon. Conic sections**:** Introduction, construction of ellipse: rectangular method, eccentricity method. Construction of parabola: rectangular method, eccentricity method. Construction of hyperbola:

eccentricity method. Special curves*:* cycloid, involute.

UNIT-II: INTRODUCTION TO COMPUTER AIDED SKETCHING (18 periods)

Computer screen, layout of the software, creation of 2D/3D environment, selection of drawing size and scale, Standard tool bar/menus, Coordinate system, description of most commonly used toolbars, navigational tools: commands and creation of lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity.

UNIT-III: PROJECTION OF POINTS, STRAIGHT LINES AND PLANES (21 periods)

Introduction, method of projection, planes of projection, reference line and notations. Projection of points: Points in all the four quadrants. Projection of straight lines**:** lines inclined to HP / VP plane, inclined to both HP and VP planes (straight lines are assumed to be in first quadrant only)**.** Projection of planes**:** projection of triangle, square, rectangle, rhombus, pentagon, hexagon and circular plane for the condition inclined to HP / VP by change of position method.

UNIT-IV: PROJECTION OF SOLIDS AND SECTION OF SOLIDS (21 Periods)

Projections of Solids: Introduction, projection of solids: prisms, pyramids, cylinders and cones with axis perpendicular to VP/HP and axis inclined to VP/HP only. Sections of solids**:** Introduction, Cutting plane, sectional views of right regular solids resting with base on HP: prisms, pyramids, cylinder and cone and true shapes of the sections.

UNIT-V: ORTHOGRAPHIC AND ISOMETRIC PROJECTIONS AND DEVELOPMENT OF SURFACES (22 periods)

Orthographic projection: simple exercises. Isometric projection: Simple exercises.

Development of surfaces: prisms, pyramids, cylinders, cone and miscellaneous surfaces

Total Periods: *100*

Note: *Student shall practice Unit-I using sketch book only and remaining units using sketch book first and later CAD package.*

TEXT BOOKS:

1. D.M.Kulkarni, A.P.Rastogi, A.K.Sarkar, *Engineering Graphics with AutoCAD*, PHI Learning Private Limited, New Delhi, Revised Edition, 2010.
2. N D Bhat & V M Panchal, *Engineering Drawing*, Charotar Publishing House, Gujarat, 51st edition, 2013.

REFERENCE BOOKS:

1. Sham Tickoo, *AutoCAD 2013 for Engineers and Designers*, Dreamtech Press, 2013.
2. M.H.Annaiah & Rajashekar Patil, *Computer Aided Engineering Drawing*, New Age International Publishers, 4th edition, 2012.
3. T.Jeyapoovan, *Engineering Drawing and Graphics Using AutoCAD,* Vikas Publishing House, 3rd edition, 2010.
4. Jolhe, *Engineering Drawing,* Tata McGraw Hill Education Private Limited, 1st edition, 2007.
5. Basant Aggarwal, *Engineering Drawing,* Tata McGraw Hill Education Private Limited, 1st edition, 2008.

I B. Tech. - II Semester

(16BT20551) **FOUNDATIONS OF DATA STRUCTURES LAB**

(Common to ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	*50*	*100*	*0*	*0*	*3*	*2*

PREREQUISITES: *A course on "Foundations of Data Structures"*

COURSE DESCRIPTION:

Hands on programming to implement data structures - Linked lists, Stacks, Queues, Trees, Search trees, Sorting, and Hashing in C Language.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1. demonstrate practical knowledge on stacks, queues, trees, graphs and Hashing Techniques

CO2. identify suitable data structure to solve engineering problems.

CO3. design solutions for complex engineering problems using linear and non-linear data structures.

CO4. develop algorithms leading to multiple solutions by conducting investigations of complex problems.

CO5. apply 'C' language as a tool for implementing linear and non linear data structures

CO6. communicate effectively by writing Programs and document practical work.

LIST OF PRACTICAL EXERCISES:

1. Implement the following sorting techniques
   (a) Quick Sort (b) Radix Sort (c) Merge Sort
2. Implement the following data structures using arrays
   (a)Stack (b) Queue (c) Circular Queue
3. Implement the following operations on a single linked list.
   (a) Creation (b) Insertion (c) Deletion (d) Display
4. Implement the following operations on a double linked list.
   (a) Creation (b) Insertion (c) Deletion (d) Display
5. Implement the following operations on a circular linked list.
   (a) Creation (b) Insertion (c) Deletion (d) Display
6. Implement the following data structures using linked list.
   (a) Stack (b) Queue (c) Circular Queue
7. Implement the following tree traversals on a binary tree
   (a) Preorder (b) Inorder (c) Postorder
8. Implement the following operation on binary search tree
   (a) Creation (b) Insertion (c) Deletion (d) Inorder
9. Implement the following graph traversal techniques
   (a) Breadth First traversal (b) Depth First Traversal
10. Implement the following Hashing Techniques
    (a) Separate Chaining (b) Open addressing methods

REFERENCE BOOKS:

1. G.A.V. Pai, *Data Structures and Algorithms,* Tata McGraw Hill, Second Edition, 2009.
2. Debasis Samanta, *Classic Data Structures,* PHI Learning, Second Edition, 2009.

II B.Tech. - I semester

(16BT3HS01) **ENVIRONMENTAL STUDIES**

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	-	3

PREREQUISITES: Course on Engineering Chemistry

COURSE DESCRIPTION:
Multidisciplinary nature of environment; Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment; Field studies.

COURSE OUTCOMES: On successful completion of this course, students will be able to

CO1. demonstrate knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pol lution and control, social issues and human population.
CO2. analyze natural resources, ecosystems, biodiversity, en vironmental pollution and control, social issues and hu man population.
CO3. develop strategies for environmental pollution control and natural resource management.
CO4. solve environmental problems through proper analysis and interpretation of environmental data.
CO5. choose appropriate techniques in environmental pollu tion control and natural resource management.
CO6. understand the impact of social issues and population on environment.
CO7. provide solutions to individuals, industries and govern ment for environmental sustainable development.
CO8. follow environmental protection laws for sustainable de velopment.

DETAILED SYLLABUS:

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENT AND NATURAL RESOURCES (11 periods)

Multidisciplinary Nature of Environment: Multidisciplinary nature of environment, Segments of environment - Lithosphere,

Hydrosphere, Atmosphere, Biosphere; Need for public awareness.

Natural Resources: Renewable and non-renewable resources and associated problems - (a) Forest resources: Use and over exploitation, Deforestation-causes, effects and remedies, Case studies, (b) Water resources: Use and over utilization of surface and groundwater, Conflicts over water, Benefits and problems of large dams, Case studies, (c) Mineral resources: Mining, Adverse effects, Case studies, (d) Food resources: World food problems, Changes caused by agriculture and overgrazing, Effects of modern agriculture, Water logging and salinity, Case studies, (e) Energy resources: Growing needs, Renewable energy resources - Solar, Wind, Hydropower, Hydrogen fuel; Non-renewable energy resources - Coal, Natural gas, Nuclear energy, Role of an individual in conservation of natural resource and equitable use of resources for sustainable lifestyles.

UNIT-II: ECOSYSTEMS AND BIODIVERSITY (10 periods)

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem - Producers, Consumers, Decomposers; Food chains, Food webs, Ecological pyramids - Types; Characteristic features, Structure and functions of forest ecosystem, Desert ecosystem, Aquatic ecosystem, Energy flow in the ecosystem, Ecological succession.

Biodiversity: Concept and value of biodiversity, Role of biodiversity in addressing new millennium challenges, Hot spots of biodiversity, Threats to biodiversity, Man-wild life conflicts, Endemic, Endangered and extinct species of India, Conservation of biodiversity - In-situ and ex-situ.

UNIT-III: ENVIRONMETAL POLLUTION AND CONTROL (08 periods)

Causes, Adverse effects and control measures of pollution - Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear pollution; Solid waste management - Causes, Effects and control measures of urban and industrial wastes; Hazards and disaster management - Floods, Earthquakes, Tsunamis, Case studies.

UNIT-IV: SOCIAL ISSUES AND THE ENVIRONMENT (08 periods)

Sustainable development, Urban problems related to energy, Environmental ethics -Issues, Solutions; Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and case studies, Wasteland reclamation, Consumerism and waste products, Concept of green technologies, Environment protection act, Air act, Water act, Wildlife protection act, Forest conservation act, Issues involved in enforcement of environmental legislation, Public environmental awareness.

UNIT-V: HUMAN POPULATION AND THE ENVIRONMENT

(08 periods)

Population growth, Population characteristics and variation among nations, Population explosion, Family welfare programme, Environment and human health, Human rights, Value education, HIV/AIDS, Women and child welfare, Role of information technology in environment and human health, Case studies, Field Work/Assignment/Seminar: Environmental assets - Pond/Forest/Grassland/Hill/ Mountain/Environment impact assessment procedures for local environmental issues.

Total periods: 45

TEXT BOOKS:

1. A. Kaushik and C. P. Kaushik, *Environmental Studies*, New Age International (P) Ltd Publications, 4th edition, 2014.
2. Erach Barucha, E*nvironmental Studies*, Orient Blackswan, 2nd edition, 2013.

REFERENCE BOOKS:

1. R. Rajagopalan, *Environmental Studies*, Oxford University Press, 2nd edition, 2011.
2. Benny Joseph, *Environmental Studies,* Tata McGraw-Hill, 2nd edition, 2009.
3. B. S. Chauhan, *Environmental Studies*, University Science Press, 2008.
4. M. Anji Reddy, *Text Book of Environmental Sciences and Technology*, BS Publications, 2007.

II B.Tech. - I Semester

(16BT3BS02) **SPECIAL FUNCTIONS AND COMPLEX ANALYSIS**

(Common to EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Intermediate/senior secondary Mathematics

COURSE DESCRIPTION: Beta, Gamma functions and their properties; Limits continuity and analyticity of complex functions; Integration, power series, singularities, residues; conformal mapping.

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

CO1.demonstrate knowledge in
- Beta and Gamma functions
- Expressing complex functions in power series
- Differentiation and integration of complex functions
- Conformal mappings and bilinear transformations
- Expressing complex functions in terms of graphs and power series

CO2.develop skills in analyzing the
- the properties exhibited by complex functions in Argand plane
- properties of real integrals through complex variable techniques
- the properties of improper integrals through residue theory
- conformal transformations of complex valued functions for inferences
- the properties of complex functions by expressing them in power series and graphs

CO3.develop skills in designing mathematical models involving
- Integrals of complex variable functions
- Improper integrals using beta and gamma functions
- Residue theory of complex functions
- Power series expansions of complex variable functions
- Transformations of complex variable functions
- Fluid flow patterns and flux functions.

CO4.develop analytical skills in providing solutions for problems involving
- Fluid, Electrical and Magnetic Potential functions
- Integration of complex functions
- Improper real integrals

CO5.(i) use relevant Complex variable techniques for
- Residues and integrals of complex functions.
- Improper real integrals through complex functions

(ii) techniques of Beta and Gamma functions to improper integrals

DETAILED SYLLABUS

UNIT-I: SPECIAL FUNCTIONS (09 periods)

Beta and Gamma functions - Properties - Relationship between Beta and Gamma functions- Evaluation of improper integrals using Beta and Gamma functions. Bessel function -Generating function (without proof)- Recurrence relations.

UNIT-II: ANALYTIC FUNCTIONS (09 periods)

Function of a Complex Variable - Limits and Continuity of functions, uniform continuity, Differentiability and Analyticity - Cauchy Riemann equations (both Cartesian and polar) - Conjugate and harmonic conjugate functions - Milne Thomson method-Potential functions.

UNIT-III: COMPLEX INTEGRATION AND POWER SERIES (09 periods)

Line integral - Evaluation of line integrals along curves and closed contours - Cauchy's Integral theorem - Cauchy's integral formula - Generalized integral formula- Evaluation of integrals using integral formula. Taylor's theorem (without proof) - Laurent's theorem (without proof) - Power series expansion of complex functions.

UNIT-IV: RESIDUE THEOREM (09 periods)

Zeros, Singularities - Types of singularities- poles - Residues - Evaluation of residues at simple poles and poles of order m - Residue theorem - Evaluation of integrals using residue theorem - Evaluation of improper and real integrals of the type:

i) $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ ii) $\int_{-\infty}^{\infty} f(x)dx$ iii) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$

UNIT-V: CONFORMAL MAPPING (09 periods)

Conformal mappings, Translation, Rotation, Inversion. Special transformations: Bilinear transformation - Properties - Fixed points - Cross ratio - Invariance of circles under bilinear transformation - Determination of bilinear transformation using three given points.

Total periods: 45

TEXT BOOK:

1. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, *Text book of Engineering Mathematics*, Vol-III, S. Chand & Company, 9th edition, 2012.

REFERENCE BOOKS:

1.Grewal, B.S, *Higher Engineering Mathematics*, Khanna Pub lishers, Delhi, 42nd edition, 2012.
2.Shahnaz Bathul, *Special Functions and Complex Variables*, PHI Learning, 2nd edition, 2010.

II B.Tech. - I Semester
(16BT30201) **DC MACHINES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Electric Circuits and Engineering Physics.

COURSE DESCRIPTION:
Construction, operation, types and applications of DC machines; Performance evaluation of various DC machines.

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

CO1. demonstrate knowledge on
- construction and operation of various types of DC machines
- armature reaction and commutation
- characteristics of DC machines
- parallel operation of DC generators
- starting, braking and speed control of DC motors
- testing of DC machines

CO2. analyze the performance of DC machine for various operating conditions

CO3. design suitable accessories / controllers for desired operation of DC Machines

CO4. solve engineering problems pertaining to DC machines and provide feasible solutions

CO5. apply the conceptual knowledge of DC machines in relevance to societal needs

DETAILED SYLLABUS:

UNIT-I: DC GENERATORS (08 periods)

Principle, operation and constructional details of generator. EMF equation and methods of excitation. Losses - constant, variable and minimization of losses. Calculation of efficiency - condition for maximum efficiency.

UNIT-II: ARMATURE REACTION AND COMMUTATION (08 periods)

Armature reaction - cross magnetizing and de-magnetizing AT/pole, compensating winding. Commutation - reactance voltage, methods of improving commutation.

UNIT-III: CHARACTERISTICS OF DC GENERATORS (10 periods)

OCC of Separately excited DC generator. Build-up of EMF in a self-excited DC generator, critical field resistance and critical speed, causes for failure of self-excitation and remedial measures. Internal and external characteristics of shunt, series and compound generators - applications.

Parallel operation of DC generators - conditions for parallel operation, use of equalizer bars and cross connection of field windings, load sharing.

UNIT-IV: DC MOTORS (11 periods)

Principle of operation of DC motor, Back EMF, speed and torque equation. Characteristics and applications of shunt, series and compound motors. Speed control of DC shunt and series motor. Ward-Leonard system. Electric braking. Starters for DC Motors (2-, 3- and 4-point).

UNIT-V: TESTING OF DC MACHINES (08 periods)

Brake test, Swinburne's test, Hopkinson's test, Field's test, Retardation test, separation of stray losses test.

Total Periods: 45

TEXT BOOKS:

1. JB Gupta, *Theory and performance of Electrical Machines (DC machines, Poly phase Circuits & AC machines) in SI Units*, S.K. Kataria& Sons, New Delhi, 15th edition, 2015.
2. R.K. Rajput, *Electrical Machines in S.I. Units*, Laxmi Publications (P) Ltd, 6th edition, New Delhi, 2017.

REFERENCE BOOKS:

1. P.S. Bimbhra, *Electrical Machinery,* Khanna Publishers, 7th edition, Delhi, 2011.
2. B.L. Theraja and A.K. Theraja, *A Text Book of Electrical Technology in S. I. Units,* Vol.2, S. Chand & Company Ltd, Multicolour illustrative edition, New Delhi, 2014.

II B.Tech. - I Semester
(16BT30202) **ELECTROMAGNETIC FIELDS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:

Courses on Multi-Variable Calculus & Differential Equations and Engineering Physics.

COURSE DESCRIPTION:

Static electric fields; Gauss's law and its applications; Potential and Potential Gradient; steady magnetic fields; Ampere's circuital law and its applications; Force in magnetic fields; behavior of various materials in electric and magnetic fields; Inductance and capacitance calculations; Maxwell's equations for time variant and time invariant fields.

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

CO1. demonstrate knowledge on:
- static electric fields due to electric charges
- static magnetic fields due to steady currents
- time varying electric and magnetic fields

CO2. analyze Maxwell's equations for both time variant and time invariant electric and magnetic fields.

CO3. solve problems using laws of electromagnetics to provide feasible solutions in electric and magnetic circuits.

CO4. select and apply appropriate law of electromagnetics to determine electric and magnetic fields around various charge distributions and current carrying conductors.

CO5. apply various principles and laws of electromagnetics to industrial applications.

DETAILED SYLLABUS:

UNIT-I: ELECTROSTATICS - I (13 periods)

Introduction to electrostatic fields, coulomb's law in vector form, electric field intensity (EFI), EFI due to various charge distributions, electric flux density, Gauss's law, application of Gauss's law - symmetrical charge distributions, differential volume element, Maxwell's first equation in point and integral form. Energy expended in moving a point charge in an electric field, electric potential, potential for different charge distributions, potential gradient, Maxwell's second equation in point and integral form.

UNIT-II: ELECTROSTATICS - II (10 periods)

Electric Dipole, dipole moment, Potential and EFI due to an electric dipole. Current density, conduction and convection current density, Ohm's law in point form, current continuity equation, conductors and dielectric materials, properties, boundary conditions between conductor and dielectric material, two perfect dielectric materials, law of refraction, polarization, Capacitance - Capacitance of a parallel plate capacitor (with and without composite dielectric), energy density in electrostatic field.

UNIT-III: MAGNETOSTATICS (09 periods)

Introduction to Magnetic fields, relation between magnetic flux density and magnetic Field Intensity (MFI), Biot-Savart's law, MFI due to various current carrying elements, Ampere's Circuital law, Maxwell's third equation in point and integral form, applications of Ampere's Circuital law - infinite line current, infinite sheet of current, infinitely long co-axial transmission line, solenoid and toroid. Maxwell's fourth equation in point and integral form. Scalar magnetic potential and vector magnetic potential.

UNIT-IV: FORCE IN MAGNETIC FIELDS (08 periods)

Force due to magnetic fields, Lorentz force equation, force on a straight and long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors. Magnetic dipole and dipole moment, torque on a current loop placed in a magnetic field, magnetization, magnetic materials, magnetic boundary conditions between different magnetic materials. Self-inductance of a solenoid, toroid, co-axial cable and two wire transmission line, energy density in magnetic field.

UNIT-V: TIME VARYING FIELDS (05 periods)

Introduction to time varying fields, Faraday's laws of electromagnetic induction, statically and dynamically induced EMF, concept of displacement current, modifications of Maxwell's equations for time varying fields, Poynting theorem.

Total Periods: 45

TEXT BOOKS:

1. William H. Hayt and John A. Buck, *Engineering Electromagnetics*, McGraw Hill Education (India) Pvt. Ltd., 8th edition, 2014.
2. Matthew N.O. Sadiku, *Principles of Electromagnetics*, Oxford University Press, New Delhi, 4th edition, 2007.

REFERENCE BOOK:

1. Joseph A. Edminister, *Theory and Problems of Electromagnetics,* Schaum's Outline Series, Tata McGraw Hill Inc., New Delhi, 2009.

II B.Tech. - I Semester

(16BT30203) SIGNALS, SYSTEMS AND NETWORKS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:
Courses on Multi-variable calculus and Differential equations, Transformation Techniques & Partial Differential Equations and Electric circuits.

COURSE DESCRIPTION:
Signals and systems in continuous-time domain; Transformations on signals; Transient analysis of DC and AC circuits; Two Port networks; Filters.

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

CO1. demonstrate knowledge on
- signals and systems
- transformation of signals in time and frequency domain
- transient behavior of various circuits
- two port network parameters
- various filters

CO2. analyze
- continuous signals and linear time invariant systems
- signals transformed in time and frequency domain
- transient response for various circuits
- network parameters for various networks
- various filter circuits

CO3. design
- different types of filters based on frequency and impedance.
- Two-port network for the given parameters.

CO4. evaluate the response of various LTI systems & signal transformations, transient response and different parameters of two port networks & filters to provide viable solutions.

CO5. apply appropriate transformation techniques for analyzing the signals and networks in time and frequency domains.

CO6. apply the conceptual knowledge of signals, transients, filters and two port network models in relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I: CONTINUOUS TIME SIGNALS AND SYSTEMS (08 periods)

Signals: Definition, test signals - Unit step, ramp, parabolic, unit impulse and exponential signals. Basic operation on signals, odd and even components, Energy and power signals.
Systems: Definition, classification, linearity, time variance, causality and stability. Response of LTI systems. Convolution of LTI systems.

UNIT-II: TRANSFORMATION OF SIGNALS (12 Periods)

Fourier transforms: Review of Fourier series, properties of Fourier series. Fourier transforms - definition, properties of Fourier transforms. Fourier transform of periodic signals, inverse Fourier transform. Applications - Circuit analysis.
Laplace transforms: Review of Laplace transform, properties of the Laplace transform, Inverse Laplace transform, theorems - initial and final value (without proof). Laplace transform of periodic signals. Applications - Circuit analysis. Comparison between Fourier and Laplace transforms.

UNIT-III: TRANSIENT ANALYSIS (10 periods)

DC Transients: Transient response of RL, RC and RLC circuits, initial conditions, solution methods using differential equation and Laplace transforms.
AC Transients: Transient response of RL, RC and RLC circuits, initial conditions, solution methods using differential equation and Laplace transforms.

UNIT-IV: TWO PORT NETWORKS (08 periods)

Network Functions - Driving point and transfer functions. Z-parameters, Y-parameters, ABCD parameters and h-parameters. Symmetry and reciprocity property in two port network. Inter-relationships of different parameters. Inter-connection of two port networks.

UNIT-V: FILTERS (07 periods)

Classification of filters, filter networks, analysis of prototype filter networks - attenuation, phase shift, characteristic impedance in pass band and stop band, constant K low pass & high pass filters, m-derived filters, band pass & band elimination filters. Design of prototype filters.

Total Periods: 45

TEXT BOOKS:

1. Lathi, Bhagwandas Pannalal, *Principles of Linear Systems and Signals,* Oxford University Press, 2nd edition, 2009.
2. Charles K. Alexander and Matthew N. O. Sadiku, *Fundamentals of Electric Circuits,* McGraw-Hill education Private Limited, New Delhi, 5th edition, 2013.

REFERENCE BOOKS:

1. Matthew N Sadiku, and Warsame Hassan Ali, *Signals and Systems: A Primer with MATLAB,* CRC Press, 2016.
2. A Chakrabarthi, *Network Analysis and Synthesis,* Dhanpat Rai & Co., New Delhi, 2nd revised edition, 2016.

II B.Tech. - I Semester

(16BT30441) **ANALOG ELECTRONIC CIRCUITS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:
Courses on Electronic Devices and Circuits and Electric Circuits.

COURSE DESCRIPTION:
BJT frequency response; Feedback amplifiers and Oscillators; Power amplifiers; Wave-shaping circuits; Multivibrators.

COURSE OUTCOMES: On successful completion of this course, students will be able to

CO1. apply the knowledge in
- BJT Frequency Response
- Feedback Amplifiers
- Oscillators
- Power Amplifiers
- Wave-shaping circuits
- Multi-vibrators

CO2. analyze BJT frequency response, amplifiers, oscillators and pulse circuits.

CO3. design and develop different types of amplifiers, oscillators and pulse circuits.

CO4. solve engineering problems pertaining to analog electronic circuits to provide valid conclusions.

CO5. apply appropriate techniques to obtain optimum solution in the field of analog electronic circuits.

CO6. provide real time solutions for societal needs in the area of analog electronic circuits.

DETAILED SYLLABUS:

UNIT-I: BJT FREQUENCY RESPONSE (10 periods)
Review of BJT simplified hybrid model, analysis of CE amplifier with emitter resistance, emitter follower, Different coupled Schemes -RC coupled amplifier, transformer coupled amplifier, Direct coupled amplifier. Frequency response of BJT amplifier, analysis at low and high frequencies, effect of coupling and bypass capacitors, The hybrid-pi common-emitter transistor model, CE short circuit current gain, current gain with resistive load, gain-bandwidth product.

UNIT-II: FEEDBACK AMPLIFIERS AND OSCILLATORS (09 periods)
The feedback concept, The transfer gain with feedback, feedback amplifier topologies, general characteristics of negative

feedback amplifiers, effect of feedback on input resistance and output resistance-voltage series, voltage shunt, current series and current shunt feedback configuration.
Oscillators: Conditions for oscillations, Hartley, Colpitts, RC phase shift oscillator using FET and Wein bridge oscillators using Transistor, crystal oscillator.

UNIT-III: LARGE SIGNAL AMPLIFIERS (09 periods)
Class A amplifiers- series-fed, transformer coupled, efficiency. Second harmonic distortion, higher-order harmonic generation.Class B amplifier, Push pull amplifiers- class B push-pull and class B complementary symmetry push-pull amplifier, efficiency, Phase inverters,Distortion in power Amplifier.

UNIT-IV: WAVE SHAPING CIRCUITS (08 periods)
High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. Diode clippers, clipping at two independent levels, clamping operation, clamping circuits taking source and diode resistances into account, practical clamping circuit.

UNIT-V: MULTIVIBRATORS (09 periods)
Bistablemultivibrator- Stable states of a bistablemultivibrator, fixed bias transistor bistablemultivibrator, unsymmetrical triggering, symmetrical triggering. MonostableMultivibrator-collector coupled monostable multivibrator, triggering of the monostablemultivibrator. Astablemultivibrator- Astable collector coupled multivibrator, Schmitt trigger.

Total Periods: 45

TEXT BOOKS:

1. Jacob Milliman, Christors C Halkias, *Integrated Electronics*, Tata McGraw-Hill, 1991.
2. J.Millman and H.Taub, Pulse, *Digital and Switching Wave forms*, McGraw-Hill, 2000.

REFERENCE BOOKS:

1. S.Salivahana, N.Suresh Kumar, *Electronic Devices and Cir cuits*, Tata McGraw-Hill, 3rd edition, 2012.
2. A. Anand Kumar, *Pulse and Digital Circuits*, Prentice Hall India, 2nd edition, 2008.

II B.Tech. - I Semester
(16BT30231) **DC MACHINES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES:
Courses on Electric Circuits and Electric Circuits Lab

COURSE DESCRIPTION:
Construction, operation, types and applications of DC machines; Performance evaluation of various DC machines.

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

CO1. demonstrate knowledge on
- construction andworkingof various types of DC machines.
- starting, braking and speed control of DC motors.
- testing of DC machines.
- parallel operation of DC generators.
- characteristics of DC machines.

CO2. analyze the performance of DC machines for various operating conditions.

CO3. design the circuit with suitable accessories / controllers for desired operating conditions of DC machines.

CO4. interpret and synthesize the data obtained from experimentation on DC machines and provide valid conclusions.

CO5. select and apply appropriate technique for testing and control of DC machines used in industry.

CO6. apply the conceptual knowledge of DC machines in relevance to industry and society.

CO7. commit to ethical principles and standards while exercising the practical investigations on DC machines.

CO8. work individually or in a group while exercising practical investigations in the field of DC machines.

CO9. communicate effectively in verbal and written form in relevance to DC machines.

DETAILED SYLLABUS:

PART-A:

1. Construction of DC machine and DC motor starters.

2. Armature windings - lap and wave, simplex and multiplex, single layer and multi-layer, equalizer rings and dummy coils.

PART-B: Any EIGHT experiments are to be conducted from the following

1. Magnetization characteristic of DC shunt generator.
2. Load test on DC shunt generator.
3. Load test on DC series generator.
4. Load test on DC compound generator (cumulative and differential connections).
5. Parallel operation of DC generator
6. Speed control of DC shunt motor.
7. Brake test on DC compound motor.
8. Brake test on DC shunt motor.
9. Brake test on DC series motor.
10. Swinburne's test.
11. Hopkinson's test.
12. Field's test.
13. Separation of losses in DC shunt machine.
14. Electric braking of DC motor

II B.Tech. - I Semester

16BT30232: **SIGNALS AND NETWORKS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES:
Courses on Multi-variable calculus & Differential equations, Transformation Techniques & Partial Differential Equations, Electric circuits and Electric Circuits Lab.

COURSE DESCRIPTION:
Experimentation on Signals and systems; Transient analysis; Twoport network parameters and passive filters.

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

CO1. demonstrate knowledge on signals, transients, two port networks & filters and their experimental implementation.
CO2. analyze and relate the experimental observations & measurements for validation.
CO3. design a suitable experimental/simulation procedure for practical investigations on signals, systems and networks.
CO4. demonstrate skills in evaluating various parameters and interpret the observations to provide feasible solutions.
CO5. select appropriate technique for experimental investigations, analysis and interpretation of signals and networks.
CO6. apply the conceptual knowledge of signals, transients, filters and twoport network models in relevance to industry and society.
CO7. commit to ethical principles and standards while exercising the practical investigations on signals and networks.
CO8. work individually or in a group in the field of signals and networks.
CO9. communicate effectively in verbal and written form in signals and networks domain.

LIST OF EXPERIMENTS:
Conduct any **TEN** experiments using appropriate Software Tools / Hardware

1. Generation of continuous time signals.
2. Basic operations on the signals.
3. Systems and their properties.
4. Convolution of signals.
5. Transformation of signals into time and frequency domains.

6. Transient response of RL circuit and applications.
7. Transient response of RC circuitand applications.
8. Transient response of RLC circuitand applications.
9. Determination of Open circuit and Short circuit parameters in isolated and interconnected networks.
10. Determination of ABCD and Hybrid parameters inisolated and interconnected networks.
11. Design, analysis and application of Low pass and High pass filters.
12. Design, analysis and application of Band Pass and Band stop filters.

II B.Tech. - I Semester

(16BT30451) **ANALOG ELECTRONIC CIRCUITS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES:
Courses on Electronic Devices and Circuits andAnalog Electronic Circuits.

COURSE DESCRIPTION:
Diode characteristics; Rectifiers; BJT and FET characteristics; UJT and SCR characteristics; BJT Amplifiers; Non-linear AND Linear Wave shaping circuits; Feed Back Amplifiers; Design of Multi-vibrator circuits; Power Amplifiers.

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

CO1. apply the knowledge in
- Diodes-PN Junction Diodes, Zener Diodes, SCR
- Transistors-BJT,FET,UJT
- Feedback amplifiers and oscillators
- Clipping and Clamping Circuits
- RC High Pass and Low Pass Circuits
- Multi-vibrators

CO2. analyze different types amplifier, oscillator and pulse cir cuits.
CO3. design different types of Electronic circuits like feed back amplifiers, Oscillators, Multi-vibrators, Schmitt Trig ger.
CO4. provide solutions through the design and conduct of experiments, analysis and synthesis.
CO5. apply biasing technique for design of amplifiers.
CO6. function effectively as an individual and as a member in a group in the area of analog electronic circuits.
CO7. communicate effectively in oral and written form in the area of analog electronic circuits.

LIST OF EXERCISES: (Minimum of **ten experiments** to be conducted)

PART - A

ELECTRONIC DEVICES AND CIRCUITS (Minimum five experiments to be conducted)

1. PN Junction and Zener diodes characteristics.
2. Ripple Factor and Load Regulations of Rectifier with and without filters of Half wave Rectifiers.
3. Ripple Factor and Load Regulations of Rectifier with and without filters of Full wave Rectifiers.

4. Input and Output characteristics of Transistor in CE configu ration.
5. Drain and Transfer Characteristics of JFET.
6. Gain and Frequency response of CE Amplifier.
7. UJT characteristics.
8. SCR characteristics.

PART B

ANALOG ELECTRONIC CIRCUITS (Minimum **five experiments** to be conducted)

1. Voltage series Feedback Amplifier
2. Current shunt Feedback Amplifier
3. Class A Power Amplifier (with transformer load).
4. Hartley and Colpitt's Oscillators.
5. Linear wave shaping- RC High Pass and Low Pass.
6. Non Linear wave shaping - Clippers and Clampers.
7. Astable Multivibrator
8. Schmitt Trigger

II B.Tech. - II Semester
(16BT40201) **ELECTRICAL MEASUREMENTS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Transformation Techniques &Partial Differential Equations and Signal, Systems & Networks.

COURSE DESCRIPTION:
Measurement of electrical quantities; construction, working, design and applications of various electrical measuring instruments; Performance evaluation of various electrical measuring instruments.

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

CO1. demonstrate knowledge on
- construction, working and testing of various measur ing in struments
- various errors and compensation
- measurement of various electrical parameters and quantities

CO2. analyze
- errors and compensations in instruments
- instrument performance
- measuring circuits

CO3. design appropriate arrangement for extension of range in measuring instruments.

CO4. estimate various electrical quantities using suitable instruments and techniques to provide viable solutions.

CO5. select& use appropriate technique and instrument for the measurement of electrical quantities in domestic and industrial applications.

CO6. apply the conceptual knowledge of electrical measur ing instruments and testing in relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I: MEASUREMENT OF VOLTAGE AND CURRENT **(12 periods)**

Measurement and methods of measurements.Static characteristics, limiting and relative limiting errors, combination of quantities with limiting errors, types of errors. Classification of analog instruments, essential operating forces and systems; PMMC and MI instruments - construction, working, torque equation, extensions, errors, compensations and advantages & disadvantages.

UNIT-II: MEASUREMENT OF POWER AND ENERGY (09 periods)

Measurement of power: Power measurements in DC and AC circuits. EDM wattmeter - construction, working, torque equation, shape of scale, errors & compensations and LPF wattmeter.Measurement of three phase active and reactive power for balanced and unbalanced loads.

Measurement of energy: Single phase induction type energy meter - construction, working, driving and braking torques, lag adjustment devices, errors & compensations. Three phase energy meter.

UNIT-III: INSTRUMENT TRANSFORMERS AND POWER FACTOR METERS (07 periods)

Current and Potential transformers - construction, working, phasor diagram, errors, characteristics. Measurement of power using instrument transformers, Testing of current transformer by Silsbee's method.

Power Factor meters - single phase and three phase electrodynamometer type.

UNIT-IV: DC AND AC BRIDGES (06 periods)

Measurement of resistance - Wheatstone bridge, Kelvin's double bridge and loss of charge method.

Measurement of inductance & quality factor - Maxwell's inductance bridge, Hay's bridge, Anderson's bridge and Owens's bridge.

M**easurement of capacitance & loss angle** - De-sauty's bridge, Schering bridge and modified Schering bridge.

Measurement of frequency - Wien's bridge.

UNIT-V: POTENTIOMETERS, DIGITAL METERS AND CRO (11 periods)

DC Potentiometers: Basic slide wire potentiometer circuit, DC Crompton's potentiometer - principle, operation, standardization and applications.

AC Potentiometers: Principle & operation of polar and coordinate type potentiometers, standardization and applications.

Digital meters and CRO: Digital voltmeters and types(ramp, integrating, successive approximation), Digital Energy meter.

Cathode ray oscilloscope: Introduction, cathode ray tube, time base generator, horizontal and vertical amplifiers, measurement of phase & frequency and lissajous patterns.

Total Periods: 45

TEXT BOOKS:

1. A.K. Sawhney, A course on *Electrical and Electronics Measurements & Instrumentation*, DhanpatRai and Co. Publishers, 19th edition, 2015.
2. J.B. Gupta, A course on *Electrical and Electronics Measurements & Instrumentation*, S.K. Kataria publishers, 14th edition, 2014.

REFERENCE BOOKS:

1. U.A. Bakshi, A. V. Bakshi, *Electrical measurements and Instrumentation*, Technical publications, 1st edition, 2009.
2. E. W. Golding & F.C. Widdis, *Electrical Measurements and Measuring Instruments*, Wheeler Publishers, 5th edition, 1997.
3. H S Kalsi, *Electronic Instrumentation*, Tata McGraw-Hill, 3rd edition, 2010.

II B.Tech - II Semester

(16BT40202) **GENERATION OF ELECTRIC POWER**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:
Courses on EngineeringPhysics, EngineeringChemistry, Electronic Devices and Circuits.

COURSE DESCRIPTION:
Generation of electric power using hydro, thermal, nuclear, gas and renewable energy sources;Cogeneration;Economic aspects of power generation and power factor improvement.

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

CO1. demonstrate knowledge on
- layout of various power plants and their operation.
- different types of turbines and their applications in power generating stations.
- non-conventional energy sources.
- aspects of cogeneration.
- economic aspects of power generation.
- power factor improvement methods.

CO2. analyze
- load factor, loss factor and their relations.
- power factor improvement methods and economic as pects of power generation.

CO3. design capacitors for most economic power factor.

CO4. evaluate various parameters and economic aspects of power generation to provide aviablesolution.

CO5. select feasible geographical sites for erecting different power plants.

CO6. apply the conceptual knowledge of electric power gen eration through conventional and non-conventional sources to substantiate the societal needs.

CO7. realizeconstraints and impacts of conventional & non-conventional power generation technology on environ ment and society.

CO8. adhere environmental regulations for eco-friendly op eration of power plants.

DETAILED SYLLABUS:

UNIT-I: HYDRO POWER STATIONS AND STEAM POWER STATIONS (09 periods)
Hierarchy of power system.Environmental regulations on power plants.

Hydro power plant: Selection of site for hydroelectric power station, layout and classification of hydroelectric power station, concept of pumped storage plants, available hydro power and mass curve.
Steam power plant: Layout of steam power plant -fuel handling, combustion equipment for steam boilers, fluidized bed combustion, ash handling, dust collectors, boilers, condenser, chimney and cooling towers.
Turbines: Classification, description and working principle of various turbines- impulse and reaction turbines, comparison between impulse and reaction turbine, Pelton wheel, Francis turbine and Kaplan turbine.

UNIT-II:NUCLEAR AND PEAK LOAD POWER PLANTS (09 periods)

Nuclear power stations: Nuclear fission, chain reaction, site selection, layout of nuclear power station, nuclear reactors-classification, components, PWR, BWR and breeder reactor.
Peak load plants:
Diesel engine power plant: Introduction, applications, site selection, classification of internal combustion engines,essential components and operationof dieselpowerplant.**Gas turbine power plant:**Gas turbines, site selection, simple gas turbine plant, energy cycle, layout and essential components of gas turbine power plant.

UNIT-III:RENEWABLE ENERGY RESOURCES (08 periods)

Introduction to micro grid, applications of renewable sources as distributed generation.Siteselection - solar and wind. **Solar power** - performance of PV cell by single diode model, PV module, terminology and applications. **Wind Power**-Wind power extracted by turbine, horizontal and vertical axis windmills. **Fuel cells**-working, Performance characteristics, types-Phosphoric and alkaline fuel cells only. **Biogas**-Biogas generation from Biomass.Impacts of renewable energy generation on environment.

UNIT-IV:ECONOMIC ASPECTS OF POWER GENERATION AND TARIFF (09 periods)

Introduction, terms and definitions - connected load, maximum demand, load factor, demandfactor, diversityfactor, plant capacityfactor, utilization factor, Plant use factor, loss factor, coincidence factor and contribution factor. Relation between loss factor and load factor. Cost analysis - initial cost, interest and methods of depreciation. Tariffs -simple, flat rate, block rate, maximum demand, two-part, three-part and power factor tariffs.

UNIT-V:COGENERATION AND POWER FACTOR CORRECTION (10 periods)

Cogeneration- Electricity generating systems, Economic benefits, Environmental benefits. Operation modes of cogeneration

systems, Factors to consider, project risks, cogeneration usage in different places, Practical aspects of installing a cogeneration plant.

Power factor correction: Causes of low power factor, methods of improving power factor -power capacitors, series and shunt capacitors for power factor correction. Most economical power factor.

Total Periods: 45

TEXT BOOKS:

1. S.N.Singh, *Electrical Power Generation, Transmission and Distribution*, PHI learning private limited, 2nd edition, 2015.
2. S. K. Dubey, Dr. S. K. Bhargava, *Non-Conventional Energy Resources*, Dhanpathrai & Co., 2011.

REFERENCE BOOKS:

1. R.K.Rajput, A textbook of *power system engineering*, Laxmi Publications (P) Ltd, 2006.
2. A S Pabla, *Electric Power Distribution*, McGraw Hill Education, 6th edition, 2014.
3. V.K.Mehta and Rohith Mehta, *Principles of Power Systems*, S Chand & Company Ltd, New Delhi, 4th Multi-color illustrative edition, 2006.
4. David Flin, Cogeneration: A User's Guide. *Renewable energy series*, Vol. 11. IET, 2010.
5. TuranGonen, *Electric Power Distribution System Engineering*, Mc Graw-Hill Book Company, 2nd edition, 2007.

II B.Tech. - II Semester

(16BT40203) **TRANSFORMERS AND INDUCTION MACHINES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	–	3

PREREQUISITES: Course on DC Machines, Electromagnetic Fields.

COURSE DESCRIPTION:
Constructional details, principle of operation, equivalent circuit, testing, performance and applications of transformers and three phase induction motors.

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

CO1. demonstrate knowledge on
- construction, operation of various types of transform ers and induction machines.
- characteristics of transformers and induction machines.
- parallel operation of transformers.
- starting, braking and speed control of induction ma chines.
- testing of transformers and induction machines.

CO2. analyze the operation and performance of transformers and induction machines for various operating conditions.

CO3. design suitable accessories / controllers for machines to meet the desired specifications.

CO4. solve engineering problems pertaining for transformers and induction machines to provide viable solutions.

CO5. select appropriate techniques and tools for desired op eration of transformers and induction machines in do mestic, agriculture and industrial applications.

CO6. apply the conceptual knowledge of Transformers and Induction Machines in relevance to industry and soci ety.

DETAILED SYLLABUS:

UNIT-I: SINGLE PHASE TRANSFORMERS (10 periods)
Single phase transformers - working principle, constructional details, types, ideal transformer, EMF equation, operation on no-load and on-load, phasor diagrams, losses, equivalent circuit, OC and SC tests, separation of losses test, efficiency and regulation. Effects of variation of frequency and supply voltage on iron losses.

UNIT-II: TRANSFORMER TESTING AND AUTOTRANSFORMER (08 periods)
Polarity test, Sumpner's test, all day efficiency.Parallel opera

tion with equal and unequal voltage ratios.Auto transformers - equivalent circuit, comparison with two winding transformers.

UNIT-III: THREE PHASE TRANSFORMERS (08 periods)
Introduction to three-phase transformers. Three-phase transformer connections - Y/Y, Y/Δ, Δ/Y and Δ/Δ, open Δ and Scott connections. Three winding transformers -tertiary windings, determination of Z_p, Z_s and Z_t. OFF-load and ON-load tap changing.

UNIT-IV: THREE PHASE INDUCTION MOTORS (09 periods)
Three phase induction motors -construction details of cage and wound rotor machines, production of rotating magnetic field, principle of operation, rotor EMF and rotor frequency, rotor reactance, rotor current and power factor at standstill and during operation, torque equation - expressions for maximum torque and starting torque, torque-slip characteristics, rotor power input, rotor copper loss and mechanical power developed and their inter relation. Double-cage and deep bar rotors. Equivalent circuit and phasor diagram.

UNIT-V: CIRCLE DIAGRAM, STARTING AND SPEED CONTROL METHODS (10 periods)
No-load and blocked rotor tests, stator resistance test, circle diagram, predetermination of performance. Methods of starting - starting current and torque calculations. Crawling and cogging. Speed control - change of frequency, change of poles, cascade connection, injection of emf into rotor circuit (qualitative treatment only). Induction generator - principle of operation.

Total Periods: 45

TEXT BOOKS:

1. JB Gupta, Theory and performance of *Electrical Machines (DC machines, Poly phase circuits & AC machines) in SI Units*, S.K. Kataria & Sons, New Delhi,15th edition, 2015.
2. P.S. Bimbhra, *Electrical Machinery*, Khanna Publishers, New Delhi, 7th edition, 2011.

REFERENCE BOOKS:

1. A.E. Fitzgerald, C.Kingsley and S.Umans, *Electric Machinery*, Mc Graw-Hill, New Delhi, 6th edition, 2008.
2. B.L. Theraja and A.K. Theraja, A Text Book of *Electrical Technology in S. I. Units*, Vol.2, S.Chand Company Ltd, Multicolour edition, New Delhi, 2014.

II B.Tech - II Semester

(16BT41002) **LINEAR AND DIGITAL ICs**

(Common to EEE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Electronic Devices and Circuits& Analog Electronic Circuits.

COURSE DESCRIPTION:
Differential Amplifier; Characteristics of Operational Amplifiers; Linear & Non-Linear Applications of Op-Amp; IC 555 timer and phase locked loops; Application of PLL; A-D & D-A Converters; CMOS and Bipolar Logic Interfacing; HDL with combinational and sequential logic design.

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

CO1. demonstrate knowledge in
- Op-amp operation and applications.
- Timer & PLL circuits.
- A-D & D-A Converters
- CMOS and Bipolar logic Interfacing.
- HDL design and programming.

CO2. analyze
- Op-amp based circuits.
- Timers for various circuits.
- Different logic families.

CO3. design
- Circuits using Op-amps.
- Logic gates using CMOS.
- Combinational and sequential circuits.

CO4. solve problems in
- Evaluating parameters of Op-amp based circuits.
- Programming of various combinational and sequential logic design.

CO5. apply appropriate modeling technique to suit IC Design.

CO6. understand the impact of design and use of Linear and Digital ICs on the development of efficient and cost ef fective products.

DETAILED SYLLABUS:

UNIT-I: OPERATIONAL AMPLIFIER (11 periods)

Op-amp internal circuit - Differential Amplifier, Transfer Characteristics, Level Translator, Output stage; Basic information of Op-Amp, Ideal & Practical operational Amplifier-Inverting, non-Inverting & Differential Amplifier, Voltage follower, DC Characteristics- Input Bias Current, Input Offset Current, Input Offset

Voltage, Total Output Offset Voltage, CMRR, PSRR, Thermal Drift. AC Characteristics- Frequency Response, Frequency Compensation, Slew Rate, Features and characteristics of 741 op-Amp.

UNIT-II: LINEAR & NON LINEAR APPLICATIONS, FILTERS (10 Periods)

Linear Applications - Integrator and differentiator, Instrumentation amplifier, AC amplifier, Non - Linear Applications - Comparators & its applications, Multivibrators: monostable and astable, RC phase shift oscillator, Log and Antilog amplifiers.
Filters: First - order LPF, HPF, Butterworth Filters, Second order LPF, HPF.

UNIT-III: IC 555 TIMER, PLL & CONVERTERS (08 Periods)

Introduction to 555 timer, functional diagram, monostable and astable operations and applications. PLL - Introduction, block schematic, principles and description of individual blocks, Voltage Controlled Oscillator (IC 566).
D-A Converters: R-2R ladder & Inverted R-2R ladder, A-D converters: Sample and hold circuit, Flash type, Successive Approximation type and Dual slope ADC.

UNIT-IV: CMOS LOGIC & HDL Programming (08 Periods)

CMOS logic, CMOS steady state electrical behavior, CMOS dynamic electrical behavior.
Introduction to Verilog: HDL based design flow, program structure, language elements, operators, User defined primitives, data flow modeling, behavioral modeling, structural modeling.

UNIT-V: MODELING & DESIGN OF DIGITAL CIRCUITS USING VERILOG (08 Periods)

Introduction to 74x283 adder, 74x151 multiplexer, 74x541, 74x245 three state devices, 74x138 decoder, 74x148 encoder, Flip-flops- SR & JK, 74x163 Counter. Design and programming of Digital IC applications using the above components.

Total Periods: 45

TEXTBOOKS:

1. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International Pvt. Ltd., 4th edition, 2010.
2. John F. Wakerly, Digital Design Principles & Practices, Pearson Education, 4th edition, 2009.

REFERENCE BOOKS:

1. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, PHI, 3rd edition, 1987.
2. J. Bhasker, *VERILOG Primer,* BS Publications, 2nd edition, 2001.
3. Stephen Brown, ZvonkoVranesic, *Fundamentals of Digital Logic* with VERILOG Design, TMH, 2nd edition, 2007.
4. T.R. Padmanabhan, B. Bala Tripura Sundari, *Design through Verilog HDL*, Wiley India, 2004.

II B.Tech - II Semester

(16BT30403) SWITCHING THEORY AND LOGIC DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:--

COURSE DESCRIPTION:
Number system and Boolean algebra; Minimization; Analysis and synthesis of digital circuits; Asynchronous Sequential Logic & Programmable Memories.

COURSE OUTCOMES: On successful completion of the course, students willbe able to

CO1. demonstrate the knowledge in
- Conversion of number systems, Binary Codes.
- Basic theorems, properties and postulates of Boolean algebra.
- Minimization of switching functions using Map method and Tabular method.
- Combinational and sequential circuits.
- Realization of Boolean functions using PLDs.

CO2. analyse combinational and sequential circuits.
CO3. design and develop various combinational, sequential circuits and PLDs.
CO4. solve problems and arrive at solutions pertaining to Digi tal Electronics.
CO5. apply minimization techniques to asynchronous and syn chronous designs and suggest appropriate design for engineering solutions.
CO6. apply appropriate logic functions to obtain optimized designs useful for the society.

DETAILED SYLLABUS:

UNIT-I:NUMBER SYSTEM & BOOLEAN ALGEBRA (10 periods)

Introduction, Binary Numbers, Number base conversions, Complements of numbers, Signed binary numbers, Binary codes, Error detection and correction codes. Boolean Algebra-Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, logic operations & Logic gates.

UNIT-II: GATE LEVEL MINIMIZATION (08 periods)

Introduction, the map method, four variable, Five variable K-map, POS & SOP Simplification, Don't care conditions, NAND & NOR Implementation, Other two level Implementation, Ex-or Function, Quine-McCluskey Technique-simplification of Boolean function using tabulation Method.

UNIT-III: ANALYSIS AND SYNTHESIS OF COMBINATIONAL CIRCUITS (10 periods)

Combinational circuits, Analysis & Design procedure, Binary Adder-subtractor, Decimal Adder, Binary Multiplier, Magnitude comparator, Decoder, Encoders, Multiplexers,Demultiplexers-1-Line to 4-Line and 1-Line to 8-LineDemultiplexers.

UNIT-IV: ANALYSIS AND SYNTHESIS OF SEQUENTIAL CIRCUITS (10 periods)

Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked sequential circuits, State Reduction & Assignment, Design procedure, Registers-Shift Registers, Counters- Synchronous counters and Asynchronous counters.

UNIT-V: ASYNCHRONOUS SEQUENTIAL LOGIC& PROGRAMMABLE MEMORIES (07 periods)

Introduction, Analysis procedure, Design Procedure, Reduction of State and flow tables, Hazards,Programmable Memories-ROM,PLA, PAL.

Total Periods: 45

TEXT BOOK:

1. M. Morris Mano, *Digital Design*, Pearson education, 5th edition, 2013.

REFERENCE BOOKS:

1. Anand Kumar, *Switching Theory and Logic Design*, PHI, 2008.
2. ZviKohavi and NirahK.Jha, *Switching theory and Finite Automata Theory*, Tata McGraw-Hill, 2nd edition, 1978.
3.Charles H. Roth, *Fundamentals of Logic Design*, Thomson Publications, 5th edition, 2004.

II B.Tech - II Semester

(16BT41041) COMPUTER ARCHITECTURE AND ORGANIZATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: --

COURSE DESCRIPTION:
Basic structure of computers; computer arithmetic operations; register transfer and organization; 8085 architecture, programming and interfacing of 8085 microprocessor; Concepts of micro programmed control, pipelining and memory system.

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

CO1. demonstrate knowledge on
- Internal organization of a computer.
- Various memories and hierarchy in a computer.
- Architecture, instruction set and addressing modes of 8085 microprocessor.

CO2. analyze the performance of a computer.
CO3. design microprocessor based systems for real time applications.
CO4. solve engineering problems and arrive at solutions by developing embedded products.
CO5. choose appropriate hardware, algorithm and program using suitable IDE.
CO6. practice professional engineering to deliver efficient and cost effective embedded based products for society.

DETAILED SYLLABUS:

UNIT-I: STRUCTURE OF COMPUTERS AND MEMORY SYSTEMS (07 periods)

Structure of Computers: Computer Types, Functional Units, Basic Operational concepts, Bus Structures, Software and Performance.

Memory System: Internal organization of memory chips - SRAM, DRAM, ROM, Flash memory and cache memory, Memory hierarchy - speed, size and cost. Auxiliary memory - Magnetic disk and tape.

UNIT-II: 8085 ARCHITECTURE (11 periods)

Microprocessor evolution and types, introduction to 8085 architecture, Pin description, Register Organization, Timing Diagram, Instruction Set: Data transfer, arithmetic and logic, branch control, I/O and machine control instructions.

UNIT-III: 8085 PROGRAMMING & INTERFACING (09 Periods)

Addressing modes, Interrupts of 8085, Simple programs, Interfacing - Memory, I/O devices - memory mapped I/O and I/O mapped I/O.

UNIT-IV: REGISTER TRANSFER AND MICROOPERATIONS (10 periods)

Register Transfer, Bus and memory transfers, Arithmetic microoperations, 4-bit arithmetic circuit, Logical microoperations, Shift Microoperations, Arithmetic logic shift unit, Computer registers, Computer Instructions, RISC Vs CISC processors, Timing and control and Instruction cycle.

UNIT-V: COMPUTER ARITHMETIC, MICROPROGRAMMED CONTROL ANDPIPELINING (08 periods)

Computer Arithmetic: Addition and Subtraction, Multiplication and Division Algorithms.
Microprogrammed Control: Control memory, address sequencing, design of control unit.
Pipelining: Basic concepts, Data Hazards, Instruction Hazards, Out of order execution.

Total Periods: 45

TEXT BOOKS:

1. M. Moris Mano, *Computer System Architecture*, Pearson/ PHI, 3rd edition, 2008.
2. Ramesh S Gaonkar, *Microprocessor - Architecture, Programming and Applications with the 8085*, Penram International Publishing Private Limited, 5th edition, 2007.

REFERENCE BOOKS:

1. Carl Hamacher, ZvonksVranesic, SafeaZaky, *Computer Organization*, Mc Graw Hill, 5th edition, 2002.
2. William Stallings, *Computer Organization and Architecture,* Pearson/PHI, 6th edition, 2003.

II B.Tech. - II Semester
(16BT40231)**ELECTRICAL MEASUREMENTS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES:
Courses on Signal, Systems and Networks,Electric Circuits Lab and DC Machines Lab.

COURSE DESCRIPTION:
Measurement of electrical quantities; Testing of single phase energy meter and current transformer.

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

CO1. demonstrate knowledge on
- measurement of electrical quantities
- measuring instruments and their testing

CO2. analyze various electrical quantities, parameters and measuring instruments.
CO3. design the circuit with suitable accessories for desired measurement and testing.
CO4. interpret and synthesize the data obtained from ex perimentation on measurement of electrical quantities to provide valid conclusions.
CO5. select and use various measuring instruments in do mestic and industrial applications.
CO6. apply the conceptual knowledge of instruments, mea surement and testing techniques in relevance to industry and society.
CO7. commit to ethical principles and standards while exer cising the practical investigations on measurement and testing techniques.
CO8. work individually or in a group in the field of electrical measurements and instrument testing.
CO9. communicate effectively in verbal and written form in relevance to electrical measurements and instrument testing.

DETAILED SYLLABUS: Conduct any **TEN** experiments from the following

1. Measurement of parameters of a choke coil using three volt meter and three ammeter methods.
2. Design of ammeter and voltmeter using shunt and multiplier.
3. Measurement of three phase active and reactive power.
4. Measurement of three phase power using one wattmeter with two no. of C.Ts
5. Calibration of LPF wattmeter by phantom loading
6. Calibration and testing of single phase energy meter

7. Calibration of dynamometer power factor meter
8. Kelvin's double Bridge and Wheatstone's bridge
9. Schering bridge& Anderson bridge.
10. Crompton D.C. Potentiometer - Calibration of PMMC amme ter and PMMC voltmeter
11. C.T testing by Silsbee's method.
12. Dielectric oil testing using HT testing kit
13. Measurement of earth and insulation resistance.
14. AC potentiometer - Calibration of AC voltmeter, parameters of choke.
15. Measurement of phase and frequency using CRO

II B.Tech. - II Semester

(16BT40232)**TRANSFORMERS AND INDUCTION MACHINES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES: Course on DC Machines Lab

COURSE DESCRIPTION:
Construction, types, operation and applications of transformers and induction machines; Performance evaluation of transformers and induction machines.

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

CO1. demonstrate knowledge on
- •construction, operation of various types of transform ers and induction machines.
- •starting and speed control of induction machines.
- •testing of transformers and induction machines.
- •parallel operation of transformers.
- •characteristics of transformers and induction machines.

CO2. analyze the performance of transformers and induction motors for various operating conditions.

CO3. design the circuit with suitable accessories / controllers for desired operation of Transformers and Induction mo tors.

CO4. interpret and synthesize the data obtained from experi mentation on transformers & induction machines and pro vide valid conclusions.

CO5. select and apply appropriate technique for testing and control of transformers & induction machines used in domestic and industrial applications.

CO6. apply the conceptual knowledge of Transformers and Induction motors in relevance to industry and society.

CO7. commit to ethical principles and standards while exer cising the practical investigations on Transformers and Induction motors.

CO8. work individually or in a group while exercising practical investigations in the field of Transformers and Induction motors.

CO9. communicate effectively in verbal and written form in relevance to Transformers and Induction motors.

DETAILED SYLLABUS:
PART-A:

1. Construction of transformers
2. Construction of three phase induction motors.

PART-B: Any **EIGHT** experiments are to be conducted from the following

1. OC and SC tests on single phase transformer.
2. Separation of core losses of a single phase transformer.
3. Load test on single phase transformer.
4. Sumpner's test on a pair of single phase transformers.
5. Conversion of single phase transformer into autotransformer.
6. Parallel operation of single phase transformers.
7. Scott connection of transformers.
8. Heat run test on a bank of single phase delta connected transformers.
9. Brake test on three phase induction motor.
10. Separation of no-load losses of three phase induction mo tor.
11. No-load and blocked rotor tests on three phase induction motor.
12. Speed control of induction motor.

II B.Tech.- II Semester
(16BT41033)**LINEAR AND DIGITAL ICs LAB**
(Common to EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES: A course on Linear and Digital ICs.

COURSE DESCRIPTION:
Op-Amp characteristics; Applications of Op-Amp; 555 timer; PLL; Digital logic families and interfacing; Digital IC Applications; Programming of digital IC's in HDL.

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

CO1. demonstrate knowledge on analog and digital circuits.
CO2. apply analytical skills to determine the op-amp parameters.
CO3. design of analog and digital circuits for Linear & Nonlinear applications.
CO4. provide valid conclusions through analysis and synthesis of analog and digital circuits.
CO5. apply appropriate simulation tools for programming of analog and digital circuits.
CO6. work individually and also in a group to develop applications using linear and digital ICs.
CO7. communicate effectively with engineering community to design analog circuits.

LIST OF EXPERIMENTS: (Minimum of **Ten** experiments to be conducted)

PART: A (Minimum of **Three** experiments to be done using any simulation software)

1. Design and Simulate an Active filter (LPF / HPF) for given cut off frequency.
2. Design and Simulate D-A converter (R-2R ladder) with required voltage levels.
3. Design and Simulate an Instrumentation Amplifier with required gain.
4. Design and Simulate Op-Amp applications - (integrator / Differentiator) for given cut off frequency.
5. Design and Simulate applications of 555 timer (Monostable / AstableMultivibrator) with given duty cycle and frequency.

PART - B: Linear IC's (Minimum of **Four** experiments to be done using hardware)

1. Design and Verify
   - Op-Amp based comparator with Given reference voltage.
   - Op-Amp based Schmitt Trigger with given Duty cycle and frequency.
2. Design and Verify the Applications of Op-Amp- (integrator / Differentiator) for given cut off frequency.
3. Design and Verify the Applications of 555 timer (Monostable / AstableMultivibrator) with given Duty cycle and fre quency.
4. Design and Verify and R-2R Ladder DAC circuit using op-amp-741.
5. Design and Verification of active filter (LPF / HPF) for given cut off frequency.
6. Design and Verify an Instrumentation Amplifier with required Gain.

PART: C (Minimum of **Three** experiments to be done using Verilog HDL)

1. Simulate the Model of Adder and Subtractor with different flow (Structural, Data and behavioral).
2. Simulate the Model of 3x8 using 2x4 Decoder & 8x3 using 4x2 Encoder.
3. Simulate the Model of 8x1 using 4x1 using 2x1 Multiplexer.
4. Simulate the Model of J-K, T, D Flip-flops using Logic gates.
5. Simulate the Model of 4-Bit Universal shift register.
6. Simulate the Model of Mod-8 Counter.

III B.Tech. - I Semester

(16BT3HS02) **MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY**

(Common to CE, EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:--

COURSE DESCRIPTION:
Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Basic concepts of Accounting (Journal, Ledger and Trial balance); Trading Account, Profit and Loss Account and Balance sheet with simple adjustments; Computerized Accounting.

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

CO1. demonstrate Knowledge in
- •Tools and concepts of Micro Economics
- •Basic Principles and concepts of Accountancy
- •Financial Accounting
- •Significance of Economics and Accountancy

CO2. apply skills in managerial decision making of an organization.

CO3. apply the economic theories i.e., Demand, Production, Cost, Markets and Price

CO4. demonstrate effective communication in Business and Accounting transactions

CO5. ascertain the profitability and soundness of an organization

CO6. practice financial accounting

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO MANAGERIAL ECONOMICS, DEMAND ANALYSIS (09 periods)

Definition, Nature and Scope of Managerial Economics.Demand: Determinants of demand - Demand function - Law of demand, assumptions and exceptions - Elasticity of demand - Types of elasticity of demand - Demand forecasting and methods of demand forecasting.

UNIT-II: THEORY OF PRODUCTION AND COST ANALYSIS (09 periods)

Production Function: Isoquants and Isocosts - Input-output relationship - Law of returns. Cost Concepts: Total, Average and Marginal Cost - Fixed Vs Variable costs - Opportunity Costs Vs Outlay Costs - Separable Costs Vs Joint Costs, Urgent Costs VsPostponable Costs- Avoidable Costs Vs Unavoidable Costs - Break Even Analysis (BEA) - Assumptions, Merits and demerits - Determination of Break Even Point (Simple problems).

UNIT-III: INTRODUCTION TO MARKETS AND PRICING (09 periods)

Market Structure: Types of Markets - Features of perfect competition - Monopoly and monopolistic competition - Price and Output determination in perfect competition, monopoly and monopolistic Markets.

Pricing :Objectives and policies of pricing - Sealed bid pricing - Marginal cost pricing - Cost plus pricing - Going rate pricing - penetration Pricing - skimming Pricing - Block pricing - Peak load pricing - Cross subsidization.

UNIT-IV: INTRODUCTION TO PRINCIPLES OF ACCOUNTING & CAPITAL (09 periods)

Accountancy: Introduction - Concepts - Conventions - Double Entry Book Keeping - Journal - Ledger - Trial Balance (Simple problems).

Capital: Significance - Types of capital - Sources of Capital.

UNIT-V: FINAL ACCOUNTS - COMPUTERIZATION OF ACCOUNTING SYSTEM (09 periods)

Introduction to Final Accounts - Trading account - Profit and Loss account and Balance Sheet with simple adjustments (Simple problems).

Computerization of Accounting System: Manual Accounting Vs Computerized Accounting - Advantages and Disadvantages of Computerized Accounting.

TEXT BOOKS:

1. A.R. Aryasri, *Managerial Economics and Financial Analysis*, Tata Mc- Graw Hill, New Delhi, 3rd edition, 2007.
2. R.Cauvery, U.K. Sudhanayak, M. Girija and R. Meenakshi, *Managerial Economics*, S. Chand and Company, New Delhi, 2nd edition, 2010.

REFERENCE BOOKS:

1. Varshaney and Maheswari, *Managerial Economics*, Sultan Chand and Sons, New Delhi, 19th edition, 2005.
2. Ms. Samba Lalita, *Computer Accouting Lab Work*, 1st edition, Kalyani Publishers, Ludhiana, 2009.
3. S.P. Jain and K.L. Narang, *Financial Accounting,* Kalyani Publishers, Ludhiana, 6th edition, 2002.

III B.Tech. - I Semester

(16BT50201) **CONTROL SYSTEMS**

(Common to EEE & ECE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Multivariable Calculus and Differential Equations, Transformation Techniques and Partial Differential Equations and DC Machines/Electrical Technology.

COURSE DESCRIPTION:

Concepts of control system, transfer function ofvarious physical systems, time response analysis, frequency responseanalysis, controller design, state space analysis.

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

CO1. demonstrate knowledge on
- •the concepts of open and closed loop control systems.
- •stability analysis in time and frequency domain.
- •controllers and compensators to meet the desired specifications.
- •state variable techniques.

CO2. analyze
- •time and frequency domain response of second order systems.
- •stability analysis using root-locus, Bode and Nyquist plots.
- •controllers and compensators to meet the desired response.
- •state space representation from transfer function.

CO3. design a compensator to meet the design specifications of control system.

CO4. solve problems pertaining to control systems to provide feasible solutions inreal time environment.

CO5. selectappropriate techniques to solve control system problems in relevance to industry.

CO6. apply the conceptual knowledge of control systems in domestic and industrial applications.

DETAILED SYLLABUS:

UNIT-I: MATHEMATICAL MODELING OF SYSTEMS **(11 periods)**

Introduction to control systems. Basic elements of control system - open loop and closed loop systems. Effect of feedback.Modeling of physical systems - electrical systems, mechanical systems, analogous systems, armature control and field control of DC motor, DC servomotor. Transfer function - block diagram reduction techniques, signal flow graph.

UNIT-II: TIME RESPONSE AND STABILITY ANALYSIS (13 periods)

Various test signals and its importance. Time response of first and second order systems, Time-domain specifications, steady state response, steady state error and error constants, static and generalized error coefficients. Routh-Hurwitz stability criterion, Root locus technique- root locus diagram, rules to construct root loci, effect of pole zero additions on the root loci.

UNIT-III: FREQUENCY DOMAIN ANALYSIS (08 periods)

Performance specifications in the frequency domain. Stability analysis - Bode plot, Polar plot and Nyquist plot.

UNIT-IV: CONTROLLERS AND COMPENSATORS (06 periods)

Introduction to controllers, effect of P, PI and PID controllers. Compensators - lag, lead, lead-lag compensator design using Bode plot.

UNIT-V: STATE SPACE ANALYSIS (07 periods)

Transfer function vs state space representation. Concepts of state, state variables and state model.Modeling of physical system in state space. Transfer function to state model and vice-versa. State transition matrix and its properties. Controllability and observability using Kalman's test.

Total Periods: 45

TEXT BOOKS:

1. A. Anandkumar, *Control Systems*, PHI learning Pvt Ltd., 2nd edition, 2014.
2. Katsuhiko Ogata, *Modern Control Engineering,* Pearson Education Publishers, 5th edition, 2010.

REFERENCE BOOKS:

1. Nagrath I.J. and Gopal M, *Control Systems Engineering*, New Age International Publications, 5th edition, 2010.
2. Richard C. Dorf and Robert H. Bishop, *Modern Control Systems,* Prentice Hall, 12th edition, 2010.
3. Benjamin C.Kuo and FaridGolnaraghi, *Automatic Control Systems,* John Wiley & Sons Publications, 8th edition, 2002.
4. A.Nagoorkani, *Control Systems,* RBA Publications, 2nd edition, 2006.

III B.Tech. - I Semester
(16BT50202) **POWER ELECTRONICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Engineering Physics, Electrical Circuits and Electronic Devices & Circuits.

COURSE DESCRIPTION:
Power semiconductor devices; Silicon Controlled Rectifier - Turn-on methods, Triggering and commutation circuits for SCR; Single phase and three phase Rectifiers; AC voltage controllers; Cycloconverters; Choppers and Inverters.

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

CO1. demonstrate knowledge on
- the characteristics of various power transistors.
- operation, switching characteristics, ratings, protec tion and combinations of SCR.
- various triggering methods and commutation techniques for SCR.
- operation of line commutated converters and SCR based forced commutated converters.

CO2. analyze the performance of different power converters subjected to various loads.

CO3. design static and dynamic equalizing circuits, snubber circuits and commutating elements for protection and functionality of power electronic circuits.

CO4. investigate various configurations of power electronic circuits to provide feasible solutions.

CO5. select an appropriate power semiconductor device and/ or circuit for real time applications.

CO6. apply the conceptual knowledge of power semiconduc tor devices and/or circuitsin relevance to industry.

DETAILED SYLLABUS:

UNIT-I: POWER SEMICONDUCTOR DEVICES (11 periods)
Introduction, Power transistors - power BJT, power MOSFET, IGBT and their characteristics. Thyristor - basic theory and operation, static and dynamic characteristics, two transistor analogy, turn-on methods, UJT firing circuits, series and parallel operation, ratings, protection against dv/dt and di/dt, design of snubber circuit.

UNIT-II: PHASE CONTROLLED RECTIFIERS (11 periods)
Single phase controlled rectifiers: Introduction, half wave controlled rectifier, bridge connections - semi and fully controlled rectifiers with R and RL loads, derivation of average load volt

age and current, effect of freewheeling diode, effect of source inductance.
Three phase controlled rectifiers: Half and fully controlled rectifiers - midpoint connection with R load, Bridge connectionswith R and RL loads, derivation of average load voltage.

UNIT-III: DUAL CONVERTERS & AC VOLTAGE CONTROLLERS (07 periods)

Dual converters - circulating and non-circulating current modes of operation of single phase and three phase dual converters with R-Load.
Single phase AC voltage controllers - two SCRs in anti-parallel with R and RL loads, derivation of rms load voltage and load current.
Cycloconverters - single phase midpoint and bridge type (step-up and step-down operations) with R and RL loads.

UNIT-IV: COMMUTATION CIRCUITS AND CHOPPERS (07 periods)

Thyristor forced commutation circuits. Chopper: step down and step up - operation,control strategies, derivation of load voltage and load currents with R and RL loads. Morgan's chopper, AC chopper.

UNIT-V: INVERTERS (09 periods)

Single phase inverters - basic operation, voltage source inverters, basic series and parallel inverters, current source inverter, voltage control by pulse width modulation techniques (single pulse, multiple pulse and sinusoidal). Three phase bridge Inverters - 180^{o} and 120^{o} conduction modes of operation.

Total Periods: 45

TEXT BOOKS:

1. Dr. P. S. Bimbhra, *Power Electronics*, Khanna Publishers, 4th edition, Delhi, 2008.
2. M. D. Singh & K. B. Kanchandhani, *Power Electronics,* Tata McGraw - Hill Publishing Company, 2013.

REFERENCE BOOKS:

1. K. L. Rao, Ch. Saibabu, *Theory of Power Electronics*, revised edition, S. Chand & Co. Ltd, New Delhi, 2009.
2. Mohan, Undeland, Robbins, *Power Electronics: Converters, Applications and Design*, 3rd edition, Wiley, 2007.
3. Muhammad H. Rashid, *Power Electronics Handbook*, 3rd edition, Butterworth-Heinemann, San Diego, 2010.

III B.Tech. - I Semester
(16BT50203) **SYNCHRONOUS MACHINES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Course onTransformers and Induction machines.

COURSE DESCRIPTION:
Construction, operation, characteristics, voltage regulation and parallel operation of alternators; operation and performance characteristics of synchronous motors; construction, operation, characteristics and applications of fractional kW motors.

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

CO1. demonstrate knowledge on
- •constructional details, working, characteristics and per formance of a three phase synchronous machine and fractional kilowatt motors.
- •armature reaction, voltage regulation and synchroni zation of alternator.
- •starting of a synchronous motor.
- •parallel operation of alternators.

CO2. analyse the performance of synchronous and single phase machines for various operating conditions.

CO3. design suitable accessories/controllers for desired opera tion of synchronous machines.

CO4. solve problems pertaining to synchronous machines and fractional kWmotors to provide feasible solutions.

CO5. select appropriate techniques for control and operation of synchronous and fractional kW machines in relevance to industrial applications.

CO6. apply the conceptual knowledge of synchronous ma chines in relevance to industry.

DETAILED SYLLABUS:

UNIT-I: SYNCHRONOUS GENERATORS (11 periods)

Constructional details of synchronous machines. Armature windings- integral slot and fractional slot, distributed and concentrated, short pitch and full pitch, winding factors. EMF equation, harmonics in generated EMF, suppression of harmonics. Armature reaction and its effect for various operating power factors. Open circuit, short circuit and ZPF characteristics of synchronous machine - phasor diagrams.

UNIT-II: REGULATION OF SYNCHRONOUS GENERATOR (07 periods)

Voltage regulation - Synchronous impedance method, Ampere Turns method, ZPF method and new ASA method. Salient pole

alternators - two-reaction theory, phasor diagrams, voltage regulation. Power flow equations in synchronous generator.

UNIT-III: PARALLEL OPERATION OF SYNCHRONOUS GENERATORS (11 periods)

Conditions for parallel operation, methods of synchronization. Synchronizing current, power and torque, rigidity factor. Effect of change of excitation and mechanical power input on parallel operation of two alternators, load sharing between two alternators, Synchronous machines on infinite bus bars. Short Circuit Ratio (SCR) and its significance, time period of oscillations.

UNIT-IV: THREE PHASE SYNCHRONOUS MOTORS (08 periods)

Principle of operation, starting methods - auxiliary-motor, damper winding, synchronous-induction motor. Phasor diagrams. Variation of current and power factor with excitation, synchronous condenser. Power flow equations in synchronous motor. Circle diagram - excitation and power circles. Hunting and its suppression.

UNIT-V: FRACTIONAL KILOWATT MOTORS (08 periods)

Single phase induction motor - constructional features, double revolving field theory. Principle, characteristics and applications of resistance split-phase motors, capacitor split phase motors, capacitor start & run split phase motors and shaded pole motor. Construction, principle, characteristics and applications of AC series motor, universal motor and reluctance motors.

Total Periods: 45

TEXT BOOKS:

1. P.S. Bimbhra, *Electrical Machinery*, Khanna Publishers, New Delhi, 7th edition, 2011.
2. JB Gupta, *Theory and performance of Electrical Machines (DC machines, Poly phase Circuits & AC machines) in SI Units,* S.K. Kataria & Sons, New Delhi, 15th edition, 2015.

REFERENCE BOOKS:

1. B.L. Theraja and A.K. Theraja, *A Text Book of Electrical Technology in S. I. Units*, Vol.2, S.Chand & Company Ltd, Multicolour edition, New Delhi, 2014.
2. P.S. Bimbhra, *Generalized Theory of Electrical Machines*, Khanna Publishers, Delhi, 7th edition, 2005.

III B.Tech.- I Semester

(16BT50204)**TRANSMISSION AND DISTRIBUTION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Generation of Electric Power, Electromagnetic Fields and Signals, Systems & Networks.

COURSE DESCRIPTION:
Parameters of overhead transmission lines and underground cables; Performance of transmission lines, travelling wave phenomenon; Types of insulators; Sag and corona; Distribution systems classification, analysis and its planning.

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

CO1. demonstrate knowledge on
- •classification of transmission and distribution systems
- •parameters and configurations of transmission and distribution systems
- •transients, corona and sag
- •insulation system for cables and transmission lines

CO2. analyze
- •the electrical and mechanical aspects of cables and transmission lines
- •various distribution feeder configurations
- •voltage drop and power loss in distribution system

CO3. design
- •parameters for transmission lines and underground cables.
- •substation feeders.

CO4. evaluate the parameters, performance& mechanical aspects of transmission lines, underground cables and distribution systems to provide feasible solutions.

CO5. select appropriate model for transmission and distribution systems while exercising modeling and planning of power system.

CO6. apply the conceptual knowledge of transmission and distribution systems in relevance to industry and society.

CO7. follow professional norms for voltage regulation in transmission and distribution systems.

DETAILED SYLLABUS:

UNIT-I: OVERHEAD TRANSMISSION LINE AND UNDERGROUND CABLES (10 periods)

TRANSMISSION LINES: Overhead line & underground cables and their types, Parameters - resistance, inductance and capacitance calculations in single and three phase transmission lines, single and double circuits, symmetrical and unsymmetrical spacing, concepts of GMR and GMD, effect of earth on capacitance.

Underground cables:Construction, types of insulating materials, classification of cables, laying of cables, insulation resistance, capacitance of single and 3-core belted cables.Grading of cables - capacitance and inter sheath grading.

UNIT-II: ANALYSIS OF TRANSMISSION LINES (10 periods)

Transmission lines:Classification - short line, medium line and long line.Equivalent circuits -end condenser, Nominal-T, Nominal-pie models. ABCD constants, voltage regulation and efficiency of transmission lines.

Travelling waves on transmission lines:Travelling waves - open end line, short circuited line, line terminated through a resistor, line connected to a cable, T-junction.Beweley's Lattice diagram.

UNIT-III: MECHANICAL ASPECTS OF OVER HEAD LINE AND CORONA (09 periods)

Overhead transmission line: Line supports, overhead line insulators, types of insulators, string efficiency and methods for improvement.

Sag in overhead line:Sag and tension calculations with equal and unequal heights of towers, effect of wind and ice on sag, stringing chart.

Corona: Corona phenomenon - factors affecting corona, critical voltages and power loss, advantages and disadvantages.

UNIT-IV: DISTRIBUTIONSYSTEMS (08 periods)

Classification and Characteristics - residential, commercial, agricultural and industrial loads.

Voltage drop calculations in DC distributors - radial DC distributor fed at one end, at both the ends (equal/unequal voltages)and ring main distributor.

Voltage drop calculations in AC distributors - power factors referred to receiving end voltage and respective load voltages.

UNIT-V: SUBSTATIONS AND DISTRIBUTION SYSTEM PLANNING (08 periods)

Classification of substations:Indoor and outdoor, gas and air insulated substations. Substation layout, different bus bar schemes, location of substations-rating of distribution substations, service area with 'n' primary feeders.

Distribution System Planning:Factors affecting system planning, substation expansion, distribution system planning models, present distribution system planning techniques.

Total Periods: 45

TEXT BOOKS:

1. C.L.Wadhwa, *Electrical power systems*, New Age International Publishers, 6th edition, 2010.
2. TuranGonen, *Electric Power Distribution System Engineering*, McGraw Hill Book Company, 2nd edition, 2012.

REFERENCE BOOKS:

1. U.A.Bakshi and M.V.Bakshi, *Transmission and Distribution of Electrical Power*, 1st edition, Technical Publications, 2009.
2. B.Gupta, *A Course in Electrical Power,* S.K.Kataria & sons, New Delhi, 11th edition, 2009.
3. V.Kamaraju, *Electrical Power Distribution Systems*, McGraw Hill Education Private Limited, 1st edition, 2009.
4. V.K. Mehta and Rohith Mehta, *Principles of Power Systems*, S Chand & Company Ltd, New Delhi, 4th Multi colour illustrative edition, 2006.

III B.Tech.- I Semester

(16BT40502) **DATABASE MANAGEMENT SYSTEMS**

(Common to EEE & ME)

(Interdisciplinary Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:--

COURSE DESCRIPTION:
Database Systems; Database Design; Relational Model; SQL Queries, Constraints and Triggers; Schema Refinement and Normal Forms; Transaction Management; Concurrency Control; Overview of Storage and Indexing.

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

CO1. demonstrate knowledge on
- •Data models and Database Languages
- •Database design
- •Normal forms
- •Storage and Indexing

CO2. analyze databases using normal forms to provide solu tions for real time applications.

CO3. design solutions for database problems using database design, views design and framing queries.

CO4. use database techniques for designing databases, man aging databases and its security.

CO5. selectSQL, Hash based Indexing and Tree based Index ing to manage data in databases.

CO6. apply contextual knowledge to develop database appli cations related to societal applications like Information Retrieval Systems, Banking and Financial systems.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTIONTO DATABASE SYSTEMS AND DATABASE DESIGN (09 periods)

Database Systems: Database system applications, Purpose of database systems, View of data-Data abstraction, Instances and Schemas, Data models; Database languages - DDL,DML; Database architecture, Database users and administrators.
Database Design: ER diagrams, Beyond ER design, Entities, Attributes and entity sets, Relationships and relationship sets, Additional features of ER model, Conceptual design with ER model.

UNIT-II: THE RELATIONAL MODEL&RELATIONAL ALGEBRA AND CALCULUS (08 periods)

Relational Model: Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design, Introduction to views, Destroying/altering tables and views.

Relational Algebra and Calculus: Preliminaries, Relational Algebra operators; Relational Calculus - Tuple and Domain Relational Calculus; Expressive power of Algebra and calculus.

UNIT-III: SQL AND SCHEMA REFINEMENT (10 periods)

SQL: Form of basic SQL query- Examples of basic SQL queries; Nested queries- Introduction to nested queries, Correlated nested queries, Set-comparison operators; Aggregate operators, NULL values-Comparison using NULL values, Logical connectives AND, OR and NOT, Impact on SQL constructs, Outer joins, Disallowing NULL values; Complex integrity constraints in SQL ,Triggers and active databases.

Schema Refinement: Problems caused by redundancy, Decompositions, Problem related to decomposition, Functional dependencies, Reasoning about FDS, Normal forms - First, second and third normal forms, BCNF; Multi valued dependencies, Fourth normal form, Join dependencies, Fifth normal form.

UNIT-IV: TRANSACTIONS AND CONCURRENCY CONTROL (09 periods)

Transactions: Transaction concept, Transaction state, Implementation of atomicity and durability, Concurrent executions,Serializability, Recoverability, Implementation of isolation,Testing for serializability.

Concurrency Control: Lock based protocols, Timestamp based protocols, Validation based protocols, Multiple granularity, Deadlock handling.

UNIT-V: STORAGE AND INDEXING (09 periods)

Storage and Indexing: Data on external storage, File organization and indexing - Clustered indexes, Primary and secondary indexes; Index data structures - Hash based indexing, Tree based indexing; Comparison of file organizations.

Tree Structured Indexing: Intuition for tree indexes, Indexed Sequential Access Method (ISAM), B+ Trees- A dynamic index structure; Search, Insert, Delete;B-Tree index files.

Total Periods: 45

TEXT BOOKS:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems,* Tata McGraw Hill, 3rd edition, 2014.
2. A.Silberschatz, H.F.Korth and S.Sudarshan, *Database System Concepts*, Tata McGraw hill, 5th edition, 2006.

REFERENCE BOOKS:

1. Ramez Elmasri and Shamkant B.Navathe, *Database Systems*, Pearson Education, 6th edition, 2013.
2. Peter Rob and Carlos Coronel, *Database Systems Design, Implementation and Management*, Cengage Learning, 7th edition, 2009.

III B.Tech.- I Semester

(16BT51003) **PRINCIPLES OF COMMUNICATIONS**

(Common to EEE and EIE)

(Interdisciplinary Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Course on Signals, Systems and Networks.

COURSE DESCRIPTION:
Fundamentals of Communications; Analog and digital communications - modulation and Demodulation Techniques; Information theory and coding.

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

CO1. demonstrate fundamental knowledge in
- •elements of communication systems.
- •amplitude, Frequency, and Phase Modulators and De modulators.
- •data transmission and detection of digital signals.
- •information theory and coding techniques.

CO2. perform analysis of different modulationtechniques and calculate various performance parameters

CO3. design and develop modulators and demodulators for communication systems.

CO4. solve engineering problems for feasibility and provide optimal solutions in the area of Analog and Digital Com munication Systems.

CO5. select the appropriate modulation and demodulation tech niques for transmission and reception of signals.

CO6. follow standards while developing the communication sys tems.

DETAILED SYLLABUS:

UNIT-I: AMPLITUDE MODULATION (10 periods)
Block diagram of Electrical Communication System, Types of Communications, Need for Modulation, Types of Amplitude Modulation: AM, DSBSC, SSBSC, Power and BW requirements, generation of AM, DSBSC, SSBSC, Demodulation of AM: Diode detector, Product demodulation for DSBSC & SSBSC.

UNIT-II: ANGLE MODULATION (09 periods)
Frequency & Phase Modulations, Advantages of FM over AM, Bandwidth consideration, Narrowband and Wideband FM, generation and demodulation of FM, Comparison of FM & PM.

UNIT-III: PULSE MODULATION (08 periods)
Elements & Advantages of Digital communication systems, PAM, Regeneration of Base band Signal, PWM and PPM, Time Division Multiplexing, Frequency Division Multiplexing, Asynchronous Multiplexing.

UNIT-IV: DIGITAL TRANSMISSION (10 periods)
Pulse Code Modulation: Advantages, Block diagram of PCM, Quantization, effect of Quantization, Quantization error, DM, ADM and Comparison.
Digital Modulation: ASK, FSK, PSK, QPSK, DPSK, Modulation and Demodulation - Coherent and Non-coherent techniques.

UNIT-V: INFORMATION THEORY AND CODING (08 periods)
Concept of Information, Entropy and Rate of Information, Coding efficiency, Shannon-Fano and Huffman Coding, Error Control Coding, Error Detection and Correction Codes, Block Codes, Convolutional Codes.

Total Periods:45

TEXT BOOKS:

1. R.P. Singh and S D Sapre, *Communication Systems - Analog and Digital*, TMH, 2nd edition 2007.
2. Simon Haykin, *Communication Systems*, John Wiley, 2nd edition 2007.

REFERENCE BOOKS:

1. H. Taub and D. Schilling, *Principles of Communication Systems,* TMH, 2nd edition, 1991.
2. Sam Shanmugam, *Digital and Analog Communication Systems*, John Wiley, 2006.

III B.Tech. - I Semester

(16BT51041) **SENSORS AND SIGNAL CONDITIONING**

(Interdisciplinary Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses onElectrical Measurements and Linear & Digital ICs.

COURSE DESCRIPTION:
Principle of operation, construction, advantages, limitations and applications of resistive, inductive, capacitive, self-generating, digital and other sensors; Signal conditioning circuits and their operations.

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

CO1. demonstrate knowledge on
- •various sensors.
- •signal conditioning circuits.

CO2. analyze
- •various sensors for measuring physical quantities.
- •signal conditioning circuits.

CO3. design an appropriate instrumentation amplifiers for com mercial applications.

CO4. evaluate physical quantities using sensors and signal conditioning circuits to provide feasible solutions.

CO5. select& use appropriate sensors for the measurement of physical quantities in domestic and industrial applica tions.

CO6. apply the conceptual knowledge of sensors and signal conditioning circuits in relevance to industry and soci ety.

DETAILED SYLLABUS:

UNIT-I: RESISTIVE SENSORS (09 Periods)

Principle of transducers, classification, Factors influencing the choice of transducers. Potentiometers, Metal and semiconductor strain gauges-principle of operation, gauge factor, gauge sensitivity; Resistance temperature detectors, Thermistors, Light dependent resistors, resistive hygrometer.

UNIT-II: CAPACITIVE AND INDUCTIVE SENSORS (09 Periods)

Capacitor sensors: Variation in overlapping area, variation in dielectric constant, variation in distance between the plates of variable and differential capacitor. Frequency response of ca

pacitive sensors.
Inductive sensors: Variable reluctance sensors, Eddy current sensors, Linear variable differential transformers, Synchros, Resolvers, Electromagnetic sensors based on Faraday's law, Hall effect sensors.

UNIT-III: SELF-GENERATING SENSORS (09 Periods)
Thermoelectric sensors: Thermoelectric effects, Thermocouple laws, Cold junction compensation, common thermocouples. Piezoelectric sensors-Piezoelectric effect, deformation modes, equivalent circuit, materials; Pyro electric Sensors-Pyro electric effect, materials; Photoelectric sensors- photovoltaic effect, materials; Magneto-strictive sensors.

UNIT-IV: DIGITAL AND OTHER SENSORS (09 Periods)
Digital transducers: Tachometer encoder, incremental encoder, absolute encoder. Semiconductor sensors- principle of operation and techniques; Film sensors-Thin film sensors, Thick film sensors; Fiber optic sensors-principle of operation, sensor technology; Ultrasonic sensors- principle of operation, sensing methods; Basics of SMART sensors.

UNIT-V: SIGNAL CONDITIONING (09 Periods)
Block diagram of signal conditioning, balance and deflection measurement in Wheatstone bridge, measurement of reactance; Push-pull bridge and Blumein bridge; Carrier amplifier, chopper amplifier, low drift amplifier and charge amplifier, Instrumentation amplifier.

Total Periods: 45

TEXT BOOKS:

1. Ramon Pallas-Areny and John G. Webster, *Sensors and Signal Conditioning*, John Wiley & Sons, Inc., 2nd edition, 2001.
2. A.K.Sawhney, *A Course in Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai & Co., 19th edi tion,2015.

REFERENCE BOOKS:

1. D. V. S Murty, *Transducers and Instrumentation*, PHI Learning Private Limited, 2nd edition, 2010.
2. D. Patranabis, *Sensors and Transducers*, PHI Learning Pri vate Limited, 2nd edition, 2003.
3. John P. Bentley, *Principles of Measurement Systems*, Pearson Education, 4th edition, 2005.

III B.Tech. - I Semester

(16BT31501) **OPERATING SYSTEMS**

(Common EEE & EIE)

(Interdisciplinary Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: --

COURSE DESCRIPTION:
Operating systems operations, scheduling; Critical section problem, deadlocks; Paging, segmentation; File Concept, Disk scheduling; I/O interface; concepts of protection.

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

CO1. demonstrate knowledge on Operating system operations, services, file management, disk management, I/O management and protection.
CO2. identify the functionality involved in process management concepts like scheduling and synchronization.
CO3. design models for handling deadlock and perform memory management.
CO4. synthesize and apply programming API's to perform Process management.
CO5. use appropriate protection tools to provide access control to Operating system users.

DETAILED SYLLABUS:

UNIT-I: OPERATING SYSTEMS OVERVIEW AND PROCESS MANAGEMENT (08 periods)
Operating systems, operations, Distributed systems, Special purpose systems, Operating systems services, Systems calls, Operating system structure.
Process Management: Process scheduling, Process Control Block, Inter process communication, Signals, Forks, Multithreading models, Threading issues, Scheduling criteria, Scheduling algorithms, Multilevel queue, Multilevel feedback queue.

UNIT-II: SYNCHRONIZATION AND DEADLOCKS (10 periods)
Synchronization: The critical-section problem, Peterson's Solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.
Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock detection, Deadlock avoidance, Deadlock recovery.

UNIT-III: MEMORY MANAGEMENT (09 periods)

Memory-Management Strategies: Swapping, Contiguous memory allocation, Paging, Structure of the page table, Segmentation.

Virtual Memory Management: Demand paging, Copy-on-Write, Page replacement Algorithms, Thrashing.

UNIT-IV: STORAGE MANAGEMENT (10 periods)

File System: File Concept, Access methods, Directory structure, File system structure, i-node, File Descriptors, File system implementation, Directory implementation, Allocation methods.

Secondary Storage Structure: Disk structure, Disk attachment, Disk scheduling, Swap-space management, Stable-storage implementation, Tertiary storage structure.

UNIT-V: I/O SYSTEMS AND PROTECTION (08 periods)

I/O Systems: I/O Hardware, Application I/O interface, Kernel I/O subsystem.

Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights.

Total Periods: 45

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, *Operating System Principles*, Wiley India Edition, 7th edition, 2011.

REFERENCE BOOKS:

1. William Stallings, *Operating Systems, Internals and Design Principles*, Pearson Education, 7th edition, 2013.
2. Andrew S. Tanenbaum, *Modern Operating Systems*, PHI, 3rd edition, 2009.

III B.Tech. - I Semester
(16BT50231) **CONTROL SYSTEMS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES: Courses on Signals, Systems and Networks, DC Machines, Transformers & Induction Machines, Analog Electronic Circuits and Linear & Digital ICs.

COURSE DESCRIPTION:
Open and closed loop systems; DC and AC servo motor; stability analysis for mechanical and electrical systems; process control system; design of compensators.

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

CO1. demonstrate knowledge on
- open and closed loop systems
- stability analysis of a given system
- process control
- speed control of DC motor
- compensators

CO2. analyze
- characteristicsof AC and DC servomotors
- stability of the system using root locus, Bode and Nyquist plots
- time and frequency domainspecifications of second or der system
- concept of controllability and observability of the system

CO3. design
- compensators& controllers to analyze the stability of the system
- ladder network for PLC to verify boolean expressions

CO4. interpret the experimental investigations to provide fea sible solutions using the concepts of control engineering.

CO5. select and apply appropriate technique for solving com plex problems in control systems.

CO6. apply the conceptual knowledge of control systems in relevance to industry and society.

CO7. commit to ethical principles and standards while exer cising the practical investigations on control systems.

CO8. work individually or in a group in the domain of control systems.

CO9. communicate effectively in verbal and written form in relevance to control systems.

DETAILED SYLLABUS:

Conduct any TEN experiments from the following:

1. Programmable logic controller - study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
2. Effect of feedback on DC servomotor.
3. Determination of transfer function for a given Mechanical/ Electrical system.
4. Performance Characteristics of DC and AC servomotor.
5. Time response of second order system.
6. Determination of time domain specifications for unit step input using MATLAB.
7. Stability analysis of Mechanical and Electrical systems.
8. Study and analysis of second order system using frequency response and determination of transfer function from Bode plot.
9. Effect of P, PI and PID controllers on a second order system (Hardware/Software).
10. Lag, Lead and Lag-lead compensation of a linear time invariant system using Bode plot.
11. Analysis of a physical system using MATLAB.
    - •Transfer function to state space and Vice versa
    - •Controllability and observability
    - •Implementation using SIMULINK
12. Design of P, PI and PID controllers for a time delayed systems.
13. Balance control of rotary inverter pendulum using LABVIEW.
14. Performance analysis of water tank level controller.

III B.Tech. - I Semester
(16BT50232) **SYNCHRONOUS MACHINES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES: Course on Transformers and Induction Machines Lab

COURSE DESCRIPTION:
Construction, performance and parallel operation of alternators; V and inverted-V curves for synchronous motor; determination of equivalent circuit and performance characteristics of single phase induction motors.

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

CO1. demonstrate knowledge on
- construction and operation of 3-phase synchronous machines and 1-phase motors.
- V and inverted-V curves of synchronous motor.
- parallel operation of 3-phase synchronous generat - tors.
- characteristics of synchronous machines.

CO2. analyze the performance of synchronous and fractional kW machines for various operating conditions.

CO3. design the circuit with suitable accessories / control lers for desired operating conditions of synchronous and fractional kW machines.

CO4. interpret and synthesize the data obtained from ex - perimentation on synchronous and fractional kW machines to provide valid conclusions.

CO5. select and apply appropriate technique for testing and control of synchronous and fractional kW machines for domestic and industrial applications.

CO6. apply the conceptual knowledge of synchronous and fractional kW machines in relevance to domestic and industrial needs.

CO7. follow ethical principles and standards while exercisingthe practical investigations on synchronous and fractional kW machines.

CO8. work individually or in a group while exercising practical investigationsin the field of synchronous and fractional kW machines.

CO9. communicate effectively in verbal and written form in relevance to synchronous and fractional kW machines.

DETAILED SYLLABUS:

PART - A:

1. constructional details of alternator.
2. constructional details of single phase induction motor.

PART - B: Conduct any EIGHT experiments

1. Regulation of a three phase alternator by E.M.F and M.M.F. methods.
2. Regulation of three phase alternator by Z.P.F. and A.S.A methods.
3. Efficiency of a three phase alternator.
4. Determination of Xdand Xq of a salient pole synchronous machine.
5. Parallel operation of alternators.
6. V and inverted V curves of a three phase synchronous motor.
7. Determination of sequence impedance of a three phase alternator.
8. Equivalent circuit of a single phase induction motor.
9. Brake test on single phase induction motor.
10. Performance characteristics of Schrage motor.
11. Performance characteristics of Universal motor.

III B.Tech. - I Semester

(16BT4HS31) **SOFT SKILLS LAB**

(Common to EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES: English Language Laboratory in I B.Tech or English Laboratory at Diploma Level.

COURSE DESCRIPTION:
This course coversBody Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

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

CO1. demonstrate knowledge in
- Goal Setting
- Creative Thinking
- Leadership Skills and
- Team Work

CO2. analyse the situations and develop skills for
- Body Language
- Personality Development and
- Stress Management

CO3. apply the techniques of soft skills in a problem situation enhanced through multimedia software.

CO4. function effectively as an individual and as a member in diverse teams.

CO5. communicate effectively in public speaking in formal and informal forums.

LIST OF EXERCISES:

1. Body Language
2. Assertiveness
3. Goal Setting
4. Creative Thinking
5. Interpersonal Skills
6. Team Work
7. Conflict Management
8. Etiquette
9. Report Writing
10. Resume Writing
11. Group Discussions
12. Interviewing Skills

Total Lab Slots: 10

REFERENCE BOOKS:

1. R. C. Sharma & Krishna Mohan, *Business Correspondence and Report Writing*, Tata McGraw-Hill Publishing Company Limited, 3rd edition, New Delhi, 2012.
2. Gopalswamy Ramesh and Mahadevan Ramesh, *The Ace of Soft Skills*, Pearson, Noida, 2010.
3. Jeff Butterfeild, *Soft Skills for Everyone, Cengage learning*, Delhi, 2011.
4. Barun K. Mitra, *Personality Development and Soft Skills*, Oxford University Press, Noida, 2012

SUGGESTED SOFTWARE:

1. ETNL Language Lab Software Version 4.0
2. GEMS - Globarena E- Mentoring System
3. Speech Solutions.
4. English Pronunciation Dictionary by Daniel Jones.
5. Learning to Speak English 8.1, The Learning Company - 4 CDs.
6. Mastering English: Grammar, Punctuation and Composition.
7. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
8. Dorling Kindersley Series of Grammar, Punctuation, Compo sition etc.
9. Language in Use 1, 2 & 3.
10. Cambridge Advanced Learner's Dictionary - 3rd Edition.
11. Centronix - Phonetics.
12. Let's Talk English, Regional Institute of English South India.
13. Ultimate English Tutor.

III B.Tech.- II Semester

(16BT5HS01) **MANAGEMENT SCIENCE**

(Common to ECE, EEE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: --

COURSE DESCRIPTION:
Concepts of Management; Environmental Scanning; Concepts Related to Organization; Operations Management; Work Study; Statistical Quality Control; Inventory Management; Marketing; Human Resource Management; Project Management; Project Crashing; Entrepreneurship; Contemporary Management Practices.

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

CO1. demonstrate the concepts of operations management, human resources management, project management and contemporary management practices in managerial con text.
CO2. identify and analyse management problems in the busi ness organizations reaching substantiated conclusions using principles of management.
CO3. design appropriate organization structure for meeting the needs of the organization with consideration of the employees of the organization.
CO4. competently employ broad based analytical tools for decision making, system design, analysis and perfor mance.
CO5. provide solution to organizations for sustainable devel opment.
CO6. apply knowledge of engineering and management prin ciples to manage the projects in multidisciplinary envi ronments.

DETAILED SYLLABUS:

UNIT-I:INTRODUCTION TO MANAGEMENT AND ORGANIZATION (09 periods)

Concepts of management and Administration, Nature and Importance of management, Evolution of management thought, Functions of management, Contributions ofF.W. Taylor and Henry Fayol to the management, Systems approach to management, Managerial skills, Elements of corporate planning process, Environmental scanning, SWOT Analysis, Social responsibilities of management.

Basic concepts related to organization, Objectives and Principles, Types of organizations- Line Organization, Line and Staff Organization, Functional Organization, Matrix Organization, Network organization.

UNIT-II: OPERATIONS MANAGEMENT (12 periods)

Plant location- Factors and Principles; Plant Layout- Principles and Types; Methods of production, Work study- Basic procedure involved in method study and work measurement; Statistical Quality Control- Factors affecting quality, Control charts for variables and attributes, Acceptance sampling; Materials management- objectives, Inventory- Types of inventory, Classical EOQ model, ABC analysis; Purchase procedure, Stores management, Marketing- Functions, Channels of distribution.

UNIT-III: HUMAN RESOURCE MANAGEMENT (HRM) (06 periods)

Nature and scope of HRM, Functions of HRM, Role of HR Manager in an organization, Job evaluation, Merit rating, Maslow's hierarchy of human needs, McGregor's theory X and theory Y, Herzberg's two-factor theory of motivation.

UNIT-IV: PROJECT MANAGEMENT (PERT/CPM) AND ENTREPRENEURSHIP (09 periods)

Network analysis - Critical path method (CPM), Program evaluation and review technique (PERT); Project cost analysis - Project crashing.

Introduction to Entrepreneurship, Entrepreneurial Traits, Entrepreneur vs Manager, Role of Entrepreneurship in Economic Development, Women as an Entrepreneur.

UNIT-V: CONTEMPORARY MANAGEMENT PRACTICES (09 periods)

Basic concepts of Material Requirements Planning, Enterprise resource planning (ERP), Just In Time (JIT) system, Total Quality Management (TQM), Value Chain Analysis, Business Process Outsourcing (BPO), Globalization, Management Challenges, Supply Chain Management (SCM), Role of Information Technology in managerial decision making, Six Sigma Concept, Maintenance Strategies- Preventive, Periodic and Breakdown Maintenance..

Total Periods: 45

TEXT BOOKS:

1. O.P. Khanna, *Industrial Engineering and Management*, Dhanpat Rai and Sons, 2010.
2. MartandT.Telsang, *Industrial Engineering and Production Management*, S. Chand, 2nd edition, 2006.

REFERENCE BOOKS:

1. Koontz and Weihrich, Essentials of Management, TMH, 6th edition, New Delhi, 2007.
2. N.D. Vohra, *Quantitative Techniques in Management*, TMH, 2nd edition, New Delhi.

III B.Tech - II Semester

(16BT60201) **POWER SEMICONDUCTOR DRIVES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:Courses on Power Electronics, Synchronous Machines and Control Systems.

COURSE DESCRIPTION:
DC drives: Rectifier fed and Chopper fed drives; AC Drives: Induction motor drives, Synchronous and Stepper motor drives.

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

CO1. demonstrate knowledge on
- dynamics of electrical drives.
- operation and speed control of various DC & AC drives.
- open loop and closed loop control of DC & AC drives.

CO2. analyze single and multi-quadrant operations of DC & AC drives with speed-torque characteristics.

CO3. design and develop various configurations of power elec tronic converters for AC & DC drives.

CO4. investigateopen and closed loop operations of various drives using different speed control techniquesto enhance the drive performance.

CO5. applyappropriate power converters for controlling the drives in real time applications.

CO6. apply the conceptual knowledge of power semiconduc tor drivesin relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO ELECTRICAL DRIVES **(08 periods)**

Concept of electrical drives.Dynamics of electrical drives - fundamental torque equations, speed-torque conventions and multi-quadrant operation; Load torques - components, nature and classification.Steady state stability.Electric braking methods - regenerative dynamic and plugging.Modes of operation of electrical drive. Speed control and drive classifications, closed loop control of drives.

UNIT-II: SINGLE PHASE AND THREE PHASE CONVERTER FED DC DRIVES **(11 periods)**

Introduction to DC drives, control of DC separately excited motor by single-phase and three-phase half and full converters - voltage and current waveforms for continuous and discontinuous motor currents, speed-torque equations and characteristics. Dual converter control of DC separately excited motor.

UNIT-III: DC CHOPPER FED DRIVES (08 periods)
Control of DC separately excited motor by one, two and four quadrant choppers, voltage and current waveforms for continuous conduction mode. Closed loop model of separately excited DC motor, closed loop speed control scheme.

UNIT-IV: INDUCTION MOTOR DRIVES (10 periods)
Introduction, stator voltage control by AC voltage controllers.Stator frequency control - slip speed control, torque and power limitations, modes of operation.Variable frequency control by voltage source inverters (VSI), current source inverters (CSI).Static rotor resistance control. Slip power recovery schemes - static Scherbius drive, static Kramer drive.

UNIT-V: SYNCHRONOUS AND STEPPER MOTOR DRIVES (08 periods)
Modes of variable frequency control. Operation of self-controlled synchronous motors byVSI, CSI. Load commutated CSI fed synchronous motor drive - operation and waveforms. Stepper motor drives - torque Vs stepping rate characteristics, drive circuits.

Total Periods: 45

TEXT BOOKS:

1. Gopal K. Dubey, *Fundamentals of Electric Drives*, Narosa Publications, 2nd edition, 2004.
2. VedamSubramaniam, *Electric drives (concepts and applications)*,Tata Mc Graw-Hill Education, 2011.

REFERENCE BOOKS:

1. Gopal K. Dubey, *Power Semiconductor Controlled Drives*, Prentice-Hall International, 1989.
2. Paresh C. Sen, *Thyristor DC Drives*, Wiley-Interscience, 1981.

III B.Tech.- II Semester

(16BT60202) **POWER SYSTEM ANALYSIS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	–	3

PREREQUISITES: Courses on Matrices & Numerical Methods, Electric Circuits and Transmission and Distribution.

COURSE DESCRIPTION:
Per unit representation; Symmetrical component theory; Sequence networks for power system networks; Formulation of bus impedance and admittance matrices; Computation of power flow using various numerical techniques; Analysis of various faults; Power system stability analysis.

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

CO1. demonstrate knowledge on
- per unit representation, symmetrical component theory and sequence network representation of power system networks.
- formation of power system network matrices.
- load flow studies.
- various faults.
- power system stability.

CO2. analyze
- the power system network for sequence network rep resentation.
- the power system networks for the formation of bus impedance and admittance matrices.
- the load flow problem of a power system network for different conditions.
- various faults.
- the stability of the power system under different oper ating conditions.

CO3. evaluate
- per unit quantities for various power system compo nents and networks.
- thepower system network for various planning strate gies and provide a feasible solution.

CO4. apply appropriate techniques/methods to analyze power system networkoperating under various conditions.

CO5. apply the conceptual knowledge of power system analysis to assess and analyze a power system for various scenarios.

DETAILED SYLLABUS:

UNIT-I: PER UNIT SYSTEMS AND SYMMETRICAL COMPONENT THEORY (10 periods)

Per unit system representation, advantages, per unit equiva

lent reactance representation of power system components. Symmetrical component theory - voltages, currents and impedances.Sequence representation of power system components - generators, transformers, transmission line, load and networks.

UNIT-II: POWER SYSTEM NETWORK MATRICES(08 periods)
Bus admittance matrix - Direct inspection method.Bus impedance matrix- Formation of Zbus matrix for partial network, algorithm for the modification of bus impedance matrix - addition of element from a new bus to reference, new bus to an old bus, between an old bus & reference and between two old buses.

UNIT-III: POWER FLOW STUDIES (12 periods)
Introduction, derivation of static load flow equations. Load flow solution using Gauss-Seidel method, Newton-Raphson method - with and without PV bus, Decoupled and Fast decoupled methods (maximum of 3-buses for one iteration only). Algorithm and flowcharts, Comparison of different load flow methods.

UNIT-IV: FAULT ANALYSIS (08 periods)
Introduction, Unsymmetrical faults - LG, LL, LLG - with and without fault impedance. Symmetrical fault - LLL & LLLG faults. Symmetrical fault analysis using Zbus, short circuit current and MVA calculations.

UNIT-V: POWER SYSTEM STABILITY (07 periods)
Elementary concepts of stability.Steady state stability - power limit, transfer reactance, power angle curve, derivation of swing equation.Transient stability - equal area criterion, applications - critical clearing angle, critical clearing time. Methods to improve stability - auto re-closure and fast operating circuit breakers.

Total Periods: 45

TEXT BOOKS:

1. C. L. Wadhwa, *Electrical Power Systems*, New Age International (P) Limited publishers, New Delhi, 6th edition, 2010.
2. P. Venkatesh, B.V. Manikandan, S. Charles Raja and A. Srinivasan, *Electrical power systems analysis, Security and deregulation*, PHI learning private limited, Delhi, 2014.

REFERENCE BOOKS:

1. G. W. Stagg and A.H. El-Abiad, *Computer Methods in Power System Analysis*, Mc Graw-Hill, New Delhi, International student edition, 1968.
2. John J. Grainger and William D. Stevenson, JR, *Power System Analysis*, Mc Graw-Hill Education (India) Pvt. Limited, 1994.
3. HadiSaadat, *Power System Analysis*, Tata Mc Graw-Hill Pub lishing Company Limited, New Delhi, 2nd edition, 2002.

III B.Tech. - II Semester

(16BT50501) **COMPUTER NETWORKS**

(Interdisciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	–	3

PREREQUISITES:Course on Computer Architecture and Organization

COURSE DESCRIPTION:
Introduction to Computer Networks; The Physical Layer; The Data Link Layer; The Medium Access Control Sublayer; The Network Layer; The Transport Layer; The Application Layer.

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

CO1. demonstrate knowledge on:
- Functionalities of Various OSI and TCP/IP layers
- 3G Mobile phone networks, 802.11
- TCP,UDP and SMTP

CO2. analyze the issues related to data link, medium access and transport layers by using channel allocation and connection management schemes.

CO3. design and compute subnet masks and addresses for networking requirements.

CO4. solve problems related to Flow control, Error control, congestion control and Network Routing.

CO5. apply Network Standards - 802.3 and 802.11 for devel oping computer Networks.

CO6. assess the impact of wired and wireless Networks in the context of societal applications like VoIP, Multi-user Net work Games, Internet of Things.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION AND PHYSICAL LAYER(09 periods)
Introduction: Network hardware, Network software, Reference models - OSI, TCP/IP; Example networks - Internet; Wireless LANs - 802.11.
Physical Layer: Guided transmission media, Wireless transmission.

UNIT-II: DATA LINK LAYER AND MEDIUM ACCESS CONTROL SUBLAYER (10 periods)
Data Link Layer: Data link layer design issues, Error detection and correction-CRC, Hamming codes, Elementary data link protocols, Sliding window protocols.
Medium Access Control Sublayer: ALOHA, Carrier sense mul

tiple access protocols, Collision-free protocols, Ethernet, Data link layer switching-Repeaters, Hubs, Switches, Routers, and Gateways.

UNIT-III: NETWORK LAYER (10 periods)

Network layer design issues, Routing algorithms - Shortest path, Flooding, Distance vector, Link state routing, Hierarchical, Broadcast, Multicast, Anycast; Congestion control algorithms, Network layer in the internet - The IP version 4 protocol, IP addresses, IP version 6, Internet control protocols.

UNIT-IV: TRANSPORT LAYER (09 periods)

UDP - Segment header, Remote procedure call, Real-time transport protocols; TCP - service model, Protocol, Segment header, Connection establishment, Connection release, Sliding window, Timer management, Congestion control.

UNIT-V: APPLICATION LAYER (07 periods)

Domain Name System (DNS)-Name space, Domain resource records, Name servers; Electronic mail-Architecture and services, User agent, Message formats, Message transfer, Final delivery; The World Wide Web- Architectural overview, HTTP.

Total Periods: 45

TEXT BOOK:

1. Andrew S. Tanenbaum and David J. Wetherall, *Computer Networks*, Pearson Education, 5th edition, 2015.

REFERENCE BOOKS:

1. Behrouz A. Forouzan, Data Communication and Networking, Tata Mc Graw-Hill, 4th edition, 2010.
2. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Pearson Education, 2nd edition, 2012.

III B.Tech.- II Semester

(16BT61001) **ARM PROCESSORS & PIC MICROCONTROLLERS**

(Common to EEE & EIE)

(Interdisciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Course on Switching theory and logic design.

COURSE DESCRIPTION:
ARM Processors architecture, Programming, PIC microcontroller architecture, Interrupts and timers of PIC microcontroller, Interfacing.

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

CO1. demonstrate knowledge in ARM Processors architecture, PIC architecture, Pin out, Instruction set.
CO2. analyze various design issues regarding usage of on chip resources and Low power modes.
CO3. design embedded systems using ARM Processors and PIC microcontrollers to suit market requirements.
CO4. solve engineering problems and arrive at solutions in de signing embedded Systems.
CO5. use on-chip resources to design embedded systems with an understanding of limitations.
CO6. practice professional engineering to deliver efficient and cost effective microcontroller based products.

DETAILED SYLLABUS:

UNIT-I: PIC MICROCONTROLLER ARCHITECTURE (10 Periods)
Microcontrollers vs general purpose microprocessor, Overview of PIC18 family, WREG register in PIC, PIC file register, Default access bank, PIC status register, Data formats and directives, Program counter and program ROM space, Arithmetic, Logic instructions, Branch, call and time delay instructions, I/O port programming, PIC18 pin description, Bit addressability of data RAM, bank switching, Macros and modules.

UNIT-II: TIMERS, SERIAL PORT AND INTERRUPTS (09 Periods)
Programming timers 0 and 1, Counter programming, Programming timers 2 and 3, Basics of serial communication, PIC18 connection to RS232, Serial port programming in assembly, PIC18

interrupts, Programming timer interrupts, Programming serial interrupts.

UNIT-III: PERIPHERALS AND INTERFACING (07 Periods)
7 segment LED and LCD interfacing, keyboard interfacing, interfacing ADC, DAC, Interfacing stepper motor, DC motor interfacing and PWM.

UNIT-IV: INTRODUCTION TO ARM PROCESSORS(09 Periods)
Introduction to ARM Cortex M3 processor, Background of ARM and ARM architecture, Cortex M3 Processor applications, Cortex M3 fundamentals, registers, Operation modes, Memory system, memory map, Memory system attributes, ARM Pipeline, Exception types.

UNIT-V: ARM PROGRAMMING (10 Periods)
Data transfer instructions, Pseudo Instructions, Data Processing Instructions, Call & unconditional Branch Instructions, Decisions & conditional Branch instructions, Several useful instructions in Cortex M3, ARM Assembly Language Programming, Thumb Instruction Set, ARM Mode & Thumb mode Programming, ARM Programming in C.

Total Periods: 45

TEXT BOOKS:

1. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny causey, *PIC Microcontroller and Embedded Systems*: Using C and PIC18, Pearson Education, 2008.
2. Joseph Yiu, The Definitive Guide to the *ARM Cortex-M3 & M4*, Elsevier, 3rd edition, 2013.

REFERENCE BOOKS:

1. Andrew Sloss, Dominic Symes, Chris Wright, ARM System Developer's Guide: *Designing and Optimizing System Software (The Morgan Kaufmann Series in Computer Architecture and Design)*, 2004.
2. John.B. Peatman, *Design with PIC Microcontroller*, Pearson education, 1988.

III B.Tech.- II Semester

(16BT61041) **PROGRAMMABLE LOGIC CONTROLLERS**

(Interdisciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Switching Theory and Logic Design.

COURSE DESCRIPTION:
Introduction to PLC; PLC ladder diagrams; programming PLC; timers, counters and sequences used in PLC; data handling functions; Bit Patterns; advanced PLC functions.

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

CO1. demonstrate knowledge on programmable logic controllers, various functions of PLCs.
CO2. analyze the process of automation using PLCs.
CO3. design skills in automating a process control.
CO4. solve engineering problems in industries using PLCs.
CO5. select suitable PLC with an understanding of limitations.
CO6. practice professional engineering to deliver efficient and cost effective designs for societyand domestic applications.

DETAILED SYLLABUS:

UNIT-I:PLC BASICS AND PROGRAMMING (09 periods)
Introduction, PLC advantages, disadvantages, PLC system, CPU, I/O modules and interfacing, power supplies, Programming equipment, Programming formats, Construction of PLC ladder diagrams, Devices connected to I/O modules. Input instructions, Outputs, Operational procedures, Programming examples using contacts and coils, Fail-Safe Circuits, Drill press operation.

UNIT-II: LADDER DIAGRAMS, REGISTERS AND TIMER FUNCTIONS (09 periods)
Digital logic gates, Boolean algebra PLC programming, Conversion examples. Ladder Diagrams for process control: Ladder diagrams & sequence listings, ladder diagram construction and flowchart for spray process system. Characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers.Timer function & Industrial applications, Counter function & industrial applications.

UNIT-III: INTERMEDIATE AND DATA HANDLING FUNCTIONS (09 periods)

Intermediate functions: Arithmetic functions, Number comparison functions, Number conversion functions. Skip, Master control relay, Jump functions. PLC data move systems: Move function, FIFO, FAL, ONS, CLR & Sweep functions and their applications.

UNIT-IV: PLC FUNCTIONS WORKING WITH BITS(08 periods)

Bit Pattern, Changing a register bit status, Shift register functions and applications, Sequencer functions and applications, Controlling of two-axis & three axis Robots with PLC, Matrix functions.

UNIT-V: ADVANCED PLC FUNCTIONS (10 periods)

Analog modules & systems, Analog signal processing, Multi-bit Data Processing, Analog output application examples, PID principle, position indicator with PID control, PID Modules, PID tuning, PID functions, Networking of PLCs, Alternative Programming languages, PLC auxiliary commands and functions.

TEXT BOOK:

1. John W. Webb & Ronald A. Reiss, *Programmable Logic Controllers Principles and Applications*, PHI, 5th edition, 2002

REFERENCE BOOK:

1. M.Chidambaram, *Computer Control of Process*, Narosa, 2nd edition, 2003.

III B.Tech.- II Semester

(16BT51241) **OBJECT ORIENTED PROGRAMMING**

(Interdisciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: --

COURSE DESCRIPTION:
Introduction of Java, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Event handling, AWT, Collection Classes; Applets, Servlets.

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

CO1. demonstrate knowledge on:
- Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.
- Packages, interfaces, multithreading, exception handling, event handling.

CO2. analyze complex engineering problems using object oriented concepts.

CO3. design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.

CO4. apply AWT and Applets to create interactive Graphical User Interfaces.

CO5. use advanced programming languages to develop web applications.

CO6. build Java Applications suitable for societal requirements.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION (10 periods)
Data types, Variables, Arrays, Operators, Control statements. Classes and Objects: Concepts of Classes, Objects, Constructors, Methods, this keyword, Garbage collection, Overloading Methods and Constructors, Parameter passing, Access control, Recursion, String Class.

UNIT-II: INHERITANCE, PACKAGES AND INTERFACES (09 periods)
Inheritance: Inheritance basics, Super keyword, Multi-level hierarchy, Abstract classes, Final keyword with inheritance.
Packages: Definition, Creating and accessing a package, Understanding CLASSPATH, Importing packages.

Interfaces: Definition, Implementing interfaces, Nested interfaces, Applying interfaces, Variables in interface and Extending interfaces.

UNIT-III: EXCEPTION HANDLING AND MULTITHREADING (08 periods)

Exception Handling: Concepts of exception handling, Exception types, Usage of Try, Catch, Throw, Throws and Finally, Built in exceptions, Creating own exception sub classes.
Multithreading: Java thread model, Creating threads, Thread priority, Synchronizing threads,Inter-thread communication.

UNIT-IV: COLLECTION CLASSES, THE APPLET CLASS AND AWT (10 periods)

Collection Classes: Array List Class, LinkedList Class, Hash set Class, LinkedHashSet Class, TreeSet Class, PriorityQueue Class, EnumSet Class.
The Applet Class: Types of applets, Applet basics, Applet architecture, Applet skeleton, Passing parameters to applets.
AWTControl Fundamentals:User interface components, Layout managers.

UNIT-V: EVENT HANDLING AND SERVLETS (08 periods)

Delegation event model: Event classes, Event Listener Interfaces - Mouse and Key; Adapter classes.
Servlets: Life cycle of a servlet, Using Tomcat for Servlet development, Create and compile the servlet source code, Servlet API, Javax.Servlet package.

Total Periods: 45

TEXT BOOK:

1. Herbert Schildt, *Java the Complete Reference*,Oracle Press, 9th edition, 2014.

REFERENCE BOOK:

1. SachinMalhotra and SaurabChoudhary, *Programming in Java*, Oxford University Press, 2nd edition, 2014.

III B.Tech.-II Semester

(16BT60203) **DESIGN AND ESTIMATION OF ELECTRICAL SYSTEMS**

(Program Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:Course on Electrical and Electronic workshop practice.

COURSE DESCRIPTION:
Design and estimation of residential & commercial buildings, over-head transmission & distribution lines andindustrial buildings; Light sources,principals of light & design,types of lamps;electric heating, welding and their applications.

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

CO1. demonstrate knowledge on
- electrical wiring of residential & commercial and indus trial buildings.
- material and size of conductors for overhead transmis-sion & distribution lines.
- light sources and illumination.
- electric heating & welding.

CO2. analyze
- estimation of residential & commercial buildings, over head transmission & distribution lines andindustrial build-ings.
- proper illumination strategy for effective lighting.
- heating and welding schemes for industrial purpose.

CO3. design of electrical wiring for residential & commercial buildings and industrial buildings, overhead transmission & distribution lines and suitable illumination system for effective lighting.

CO4. solve engineering problems pertaining to utilization of electrical energy and provide feasible solutions.

CO5. apply suitable electric wiring, heating, welding and illu mination techniques for domestic and industrial applica-tions.

CO6. apply the conceptual knowledge of utilization strategies and techniques in relevance to industry and society.

CO7. adhere the constraints and standards for applications of electric energy in different fields.

DETAILED SYLLABUS:

UNIT-I: DESIGN AND ESTIMATION OF RESIDENTIAL AND COMMERCIAL BUILDINGS (11 periods)

Introduction to residential wiring system, systems of distribution of electric energy, methods of wiring, systems of wiring, choice of wiring, rating of wires and cables, load calculations and selection of size of conductor,Introduction to estimation & costing, sequence to be followed for preparing estimate, recording of estimates, determination of required quantity of material, preparation of detailed estimates and costing of residential and commercial building. General idea about IE rule, Indian electricity act and major applicable I.E rules

UNIT-II: DESIGN AND ESTIMATION OF OVERHEAD TRANSMISSION & DISTRIBUTION LINES (09 periods)

Introduction, typical AC electrical power system, main components of overhead lines, conductor materials, determination of size of conductor for overhead transmission line, conductors configuration spacing and clearances, span lengths, testing and commissioning of overhead distribution lines, some important specifications, preparation of detailed estimates and costing of overhead transmission and distribution lines.

UNIT-III: DESIGN AND ESTIMATION OF INDUSTRIAL NETWORK INSTALLATIONS (09 periods)

Introduction and classification of industrial buildings, design process, Industries with less than or equal to 1MVA and above 1MVA load, selection of distribution architecture, selection of transformer substations, selection of drives, selection of switch gears.

UNIT-IV: PRINCIPLES OF LIGHT AND DESIGN (10 periods)

Light sources,colour characteristics, terms used in illumination,laws of illumination, polar curves, photometry - integrating sphere. Types of lamps, LED lights, photometric analysis, lighting calculations, average lumen method, light loss factor, quality of lighting, design procedures, arrangement of fixtures, factory lighting, street lighting and flood lighting.

UNIT-V: ELECTRIC HEATING AND ELECTRIC WELDING (06 periods)

ELECTRIC HEATING:Design of heating element, advantages, methods and applications - resistance, induction and dielectric heating.

ELECTRIC WELDING: Classification, resistance and arc welding, electric welding,comparison between AC and DC welding.

Total Periods: 45

TEXT BOOKS:

1. J.B.Gupta, A Course in *Electrical Installation Estimating and Costing*, S.K.Kataria and Sons, Reprint edition, 2013.
2. M. K. Giridharan, *Electrical Systems Design*, I K International Publishing House Pvt. Ltd, 3rd edition, 2015.

REFERENCE BOOKS:

1. Hemant Joshi, Residential - *Commercial and Industrial Electrical Systems: Network and Installation(Volume 1)*, Mc Graw Hill Education, 21st edition, 2007.
2. Hemant Joshi, Residential - Commercial and Industrial Elec trical Systems: Network and Installation(Volume 2), Mc Graw Hill Education, 21st edition, 2007.
3. J.B.Gupta, *Utilization of Electric Power and Electric Traction*, S.K.Kataria and Sons, 10th edition, 2013.

III B.Tech. - II Semester

(16BT60204) **DIGITAL SIGNAL PROCESSING FOR ELECTRICAL ENGINEERS**

(Program Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:Courses on Signals, Systems &Networks and Power Electronics.

COURSE DESCRIPTION:
Discrete-time signals and systems; Discrete Fourier series, Discrete Fourier Transforms (DFT) and Fast Fourier Transform (FFT) algorithms for the analysis of discrete time sequences; design and realization of Digital IIR and FIR filters; DSP based control of stepper motors; DSP based implementation of DC-DC buck-boost converters.

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

CO1. demonstrate knowledge on
- digital signals and systems
- DFT and FFT
- analog & digital filter
- digital filter realization

CO2. analyzediscrete time signals and systems using DFT and FFT techniques.

CO3. design and realize IIR and FIR digital filters using differ ent techniques.

CO4. evaluate the Discrete Fourier Transform (DFT) of a se quence and use the DFT to compute the convolution of two sequences and plot the frequency response of lin ear time-invariant systems.

CO5. userelevant DSP controllers and techniques for applica tions in power electronics and electrical machines.

CO6. apply the conceptual knowledge of digital signal pro cessing in relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I: FUNDAMENTALS OF DSP (07 periods)
Review of discrete time signals and systems, Solutions for difference equation of discrete time systems, frequency response of discrete time signals, A/D and D/A conversion, Introduction to DSP system with block diagram.

UNIT-II: FOURIER TRANSFORMS (12 periods)
Discrete Fourier series - Introduction to discrete Fourier series and its properties.

Discrete Fourier Transforms - Introduction, relation with other transforms, properties, circular and linear convolution.
Fast Fourier Transforms - Radix-2 Decimation in time and Decimation in frequency algorithms.

UNIT-III: DIGITAL FILTERS (10 periods)
Digital Vs Analog filters, advantages and disadvantages of digital filters, Realization of Digital filters using Direct form-I and Direct form-II structures.
IIR Digital Filters:
Analog low pass filter design: Butterworth and Chebyshev low pass filters. Design of IIR filter from analog filters using Impulse Invariance and Bilinear transformation techniques. Frequency transformation in digital domain.

UNIT-IV: FIR DIGITAL FILTERS (08 periods)
Linear phase FIR filters and its frequency response, location of zeros in linear phase FIR filters, Fourier series method for design of FIR filters. Design of FIR filters using windows -Rectangular, Triangular, Hamming and Blackmann windows.

UNIT-V:TMSLF2407 DSP CONTROLLERS (08 periods)
Introduction to peripherals - types of physical memory - software used (Preliminary approach). DSP based control of stepper motors - principle of hybrid stepper motors - basic operation, stepper motor drive system, implementation of stepper motor control system using LF2407 DSP controller. DSP based implementation of DC-DC buck boost converters - introduction, converter structure, continuous and discontinuous conduction modes, connecting DSP to buck-boost converter, controlling the buck-boost converter.

Total Periods: 45

TEXT BOOKS:

1. A.Anandkumar, *Digital signal processing*, PHI Learning Private limited, New Delhi,2013.
2. Hamid A. Toliyat, Steven G. Campbell, *DSP based electromechanical motion control*, CRC Press Special Indian edition, 2012.

REFERENCE BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, *Digital Signal Processing, Principles, Algorithms and Applications*, Pearson Education/PHI, 4th edition, 2007.
2. Alan.V. Oppenheim, Ronald.W. Schafer, John R Buck, *Discrete Time Signal Processing*, Prentice Hall, 2nd edition, 2006.

III B.Tech. - II Semester

(16BT60205) **ELECTRICAL MACHINE DESIGN**

(Program Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Course on Synchronous Machines.

COURSE DESCRIPTION:
Electrical machine design concepts; Design of transformers, DC machines, Induction machines and Alternators.

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

CO1. demonstrate knowledge on design concepts of various types of electrical apparatus.
CO2. analyze the specific electric& magnetic loading characteristics for performance evaluation.
CO3. design a suitable electrical machine for domestic and industrial needs.
CO4. investigate and interpret the design data for evaluating the performance of electricalapparatus to provide valid conclusions.
CO5. apply appropriate technique/procedurefor designing electrical apparatus.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION (08 periods)
Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings,leakage reactance calculation. Thermal considerations, heat flow, temperature rise, rating of machines and standard specifications.

UNIT-II: DC MACHINES (08 periods)
Output equations, main dimensions, magnetic circuit calculations, Carter's coefficient, net length of iron, real & apparent flux densities, selection of number of poles, design of armature, design of commutator and brushes, performance prediction using design values.

UNIT-III: TRANSFORMERS (09 periods)
Output equations, main dimensions, kVA output for single and three phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of tank, methods of cooling of transformers.

UNIT-IV: INDUCTION MOTORS (10 periods)

Output equation of induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of poly phase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT-V: SYNCHRONOUS MACHINES (10 periods)

Output equations, choice of loadings, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

Total Periods: 45

TEXT BOOKS:

1. A.K. Sawhney, A. Chakrabarthi , A Course in *Electrical Machine Design*, 6th edition,Dhanpat Rai & Co, Delhi, 2013.
2. M.V.Deshpande, *Design and Testing of ElectricalMachines*, PHI learning Pvt. Ltd, New Delhi, 3rd edition, May 2010.

REFERENCE BOOKS:

1. R.K. Agarwal, *Principles of Electrical Machine Design*, 5th edition, S.K.Kataria & Sons, New Delhi, 2014.
2. V.N.Mittle, Arvind Mittal, *Design of Electrical Machines*, 5th edition, Standard publications, New Delhi, 2013.
3. A. NagoorKani, *A Simplified Text in Electrical Machine Design*, 2nd edition, RBA publications, Chennai 2017.

III B.Tech. - II Semester

(16BT60206) **HVDC TRANSMISSION**

(Program Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:Courses on Power Electronics and Transmission & Distribution.

COURSE DESCRIPTION:
Need for HVDC Transmission, planning and modern trends; Analysis and control of power converters; Harmonics; Characteristics and design of filters; Faults and protection of converters.

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

CO1. demonstrate knowledge on
- different types of HVDC transmission system, various converter configurations and their control.
- effects of harmonics, faults and their control methods.

CO2. analyze
- differentconverter configurations.
- different control and protection strategies in HVDC system.
- power flow in HVDC transmission system.

CO3. demonstrate skills in designing filter circuits for minimiz ing harmonics.

CO4. solve problems in HVDC transmission to provide viable solutions.

CO5. select and apply appropriate devices, schemes and tech niques for real time applications in HVDC transmission.

CO6. apply the conceptual knowledge of HVDC transmissionin relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO HVDC TRANSMISSION **(08 periods)**

Need for HVDC transmission, apparatus required for HVDC transmission system, types of DC links, comparison of EHVAC and HVDC transmission systems, applications of HVDC transmission system, planning and modern trends in HVDC transmission system.

UNIT-II: STATIC POWER CONVERTER ANALYSIS **(10 periods)**

Introduction, analysis of Graetz circuit, characteristics of 6 pulse & 12 pulse converters, commutation process, rectifier and inverter operation, equivalent circuit for converters, special features of converter transformers.

UNIT-III: CONTROL OF HVDC CONVERTER AND SYSTEMS (10 periods)

Principle of DC link control, constant current, constant extinction angle and constant ignition angle control, individual phase control and equidistant firing angle control.Effect of source inductance on the system. Starting and stopping of DC link. Power flow control.

UNIT-IV: HARMONICS AND FILTERS (09 periods)

HARMONICS: Generation of harmonics, characteristic harmonics, calculation of AC harmonics, non-characteristic harmonics, effects of harmonics, calculation of voltage and current harmonics, effect of pulse number on harmonics.

FILTERS: Types of AC filters,filter characteristics, design of single tuned filters, design of high pass filters, DC filters.

UNIT-V: CONVERTER FAULTS AND PROTECTION (08 periods)

Converter faults, over voltages in converter station, protection against over current and over voltage in converter station, surge arresters, protection of DC line, DC breakers.

Total Periods: 45

TEXT BOOKS:

1. K.R. Padiyar,HVDC Power Transmission Systems,New Academic Science, 2nd edition, 2011.
2. Sunil S Rao, EHV-AC, HVDC Transmission and Distribution Engineering, Khanna Publishers, 3rd edition, 2001.

REFERENCE BOOKS:

1. E. Uhlman, *Power Transmission by Direct Current*, Springer Verlag, Berrlin/Heedelberg 1975.
2. Jos Arillaga, *High Voltage Direct Current Transmission, The Institute of Electrical Engineers*, London, United Kingdom, 2nd edition, 1998.
3. E. W. Kimbark, *Direct current Transmission*, John Wiely & Sons, New York.

III B.Tech.- II Semester

(16BT60207) **ADVANCED CONTROL SYSTEMS**

(Common to EEE & EIE)

(Program Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:Course on Control systems

COURSE DESCRIPTION:
Design of compensators and controllers, state space, canonical forms, controllability and observability, describing function, phase plane analysis, Lyapunov's stability analysis, Full order observer and reduced order observer.

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

CO1. demonstrate knowledge on
- state space analysis.
- various compensators and controllers.
- stability in the sense of Lyapunov.
- full and reduced order observers in state space analysis.

CO2. analyze the stability of nonlinear system using
- describing function approach.
- phase plane analysis.
- Lyapunov's method.

CO3. design suitable compensator and controllers using root locus and Bode plot.

CO4. evaluate stability of systems using pole placement and Lyopunov method to provide valid solutions.

CO5. select appropriate techniques for analyzing the stability of the system.

CO6. apply the conceptual knowledge of advanced control systems in relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I: LINEAR CONTROL SYSTEM DESIGN (10 periods)
Introduction to control system design, types of compensators, design of compensators using root locus technique. Types of controllers, design of PI, PD and PID controllers using Bode plot and root locus technique.

UNIT-II: STATE SPACE ANALYSIS (08 periods)
Review of state space analysis. Canonical forms - Controllable canonical form, observable canonical form, Jordan canonical form. Tests for controllability and observability for continuous time systems - Time varying case, time invariant case, principle of duality, controllability and observability form Jordan canonical form.

UNIT-III: ANALYSIS OF NONLINEAR SYSTEMS **(13 periods)**

Introduction to non-linear systems, different types of physical nonlinearities, describing functions, derivation of describing functions for dead zone, saturation, backlash, relay and hysteresis. Stability analysis of nonlinear systems through describing functions, phase-plane analysis, singular points, methods for constructing trajectories - Isoclines' method, delta method.

UNIT-IV:STABILITY ANALYSIS **(06 periods)**

Stability in the sense of Lyapunov.Lyapunov's stability and Lypanov's instability theorems.Direct method of Lypanov for the linear and nonlinear continuous time autonomous systems.Generation of Lyapunov functions - Variable gradient method, Krasooviski's method and Popov's criterion.

UNIT-V:DESIGN OF CONTROL SYSTEMS IN STATE SPACE **(08 periods)**

Necessity of pole placement, design by pole placement, necessary and sufficient conditions for arbitrary pole placement. Determination of feedback gain matrix using direct substitution method and Ackermann's formula. Full order observer and reduced order observer.

Total Periods: 45

TEXT BOOKS:

1. M. Gopal, *Modern Control System Theory*, New Age International (P) Ltd., 2nd edition, 2000.
2. K. Ogata, *Modern Control Engineering*, Prentice Hall of India, 4th edition, 2006.

REFERENCE BOOKS:

1. A. Nagoorkani, Advanced control theory, RBA publications, 2nd edition, 1999.
2. I.J. Nagrath and M.Gopal, *Control Systems Engineering*, New Age International (P) Ltd., 2007.

III B.Tech.- II Semester

(16BT60208) **HIGH VOLTAGE ENGINEERING**

(Program Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Engineering Physics, Engineering Chemistry, Electromagnetic Fields and Electrical Measurements.

COURSE DESCRIPTION:
Types of insulation systems; Breakdown process in solid, liquid and gaseous dielectrics; Generation of high AC and DC voltages, Impulse voltages and currents; Measurement of high voltage, current, resistivity, dielectric constant and loss factor; Testing of electrical apparatus.

COURSE OUTCOMES: on successful completion of the course, students will be able to

CO1. demonstrate knowledge on
- various insulation systems and their behavior under voltage stress.
- generation and measurement of high voltages and cur rents.
- testing of various high voltage electrical apparatus.

CO2. analyze
- breakdown phenomenon in different insulation systems.
- circuits for generation of high voltage and currents.
- methods of measuring high voltage quantities.

CO3. design circuits for high voltage generation, measure ment and testing.

CO4. evaluate different parameters in high voltage engineer ing to provide valid conclusions.

CO5. select suitable testing and diagnostic techniques for the high voltage apparatus.

CO6. apply contextual knowledge of high voltage engineering to sustain industrial needs.

CO7. follow the appropriate standard for testing of high volt age apparatus.

DETAILED SYLLABUS:

UNIT-I: BREAKDOWN PHENOMENA (09 periods)

Introduction to High Voltage engineering, electrical field stresses. **Gaseous dielectrics**: primary and secondary ionization processes, criteria for gaseous insulation breakdown mechanism-Townsend's theory, streamer's theory, corona discharges, breakdown in electro negative gases, Paschen's law and its significance, time lags of breakdown.

Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown and electro mechanic breakdow.

Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown, electro convection breakdown.

UNIT-II: GENERATION OF HVAC AND HVDC (08 periods)

Generation of HVAC: Need for cascade connection and working of transformer units connected in cascade; Series resonant circuit -principle of operation, Tesla coil.

Generation of HVDC: Voltage doubler circuit, Cockroft-walton type high voltage DC set, Vande-graaff generator, calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop.

UNIT-III: GENERATION OF IMPULSE VOLTAGE AND CURRENT (08 periods)

Introduction to standard lightning and switching impulse voltages, analysis of single stage impulse generator-expression for output impulse voltage.Multistage impulse generator - working of Marx impulse, rating of impulse generator, components of multistage impulse generator, triggering of impulse generator by three electrode gap arrangement, trigatron gap and oscillograph time sweep circuits.Generation of switching impulse voltage and high impulse current.

UNIT-IV: MEASUREMENT OF HIGH VOLTAGES (08 periods)

Chubb and Fortescue method for HVAC measurement, generating voltmeter - Principle & construction.Series resistance micro ammeter for HVDC measurements, standard sphere gap measurements of HVAC, HVDC, and impulse voltages, factors affecting the measurements. Potential dividers-resistive, capacitance and mixed RC.Measurement of high impulse currents-rogowsky coil and magnetic Links.

UNIT-V: HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS (12 periods)

Measurement of DC resistivity, measurement of dielectric constant and loss factor, partial discharge measurements.Testing of electrical apparatus - insulators, bushings, isolators, circuit breakers, cables, transformers and surge arresters; radio interference measurements.

Total Periods: 45

TEXT BOOKS:

1. M.S. Naidu and V.Kamaraju, *High Voltage Engineering*, 5th edition, Tata Mc Graw-Hill Publications, 2013.
2. E.Kuffel, W.S.Zaengl and J.Kuffel, *High Voltage Engineering*: Fundamentals, 2nd edition,2005.

REFERENCE BOOKS:

1. C.L.Wadhwa, *High Voltage Engineering*, 2nd edition, New Age International (P) Limited, 2007.
2. Mazen Abdel-Salam, Hussein Anis, Ahdab *El-Morshedy, RoshdyRadwan, High Voltage Engineering Theory and Practice*, 2nd edition (Revised & Expanded) Marcel-Dekker Publishers(Special Indian Edn.).
3. L.L.Alston, *High Voltage Technology*, Oxford University Press, 1st Indian edition, 2011.

III B.Tech.- II Semester

(16BT60209) **INSTRUMENTATION**

(Program Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:Courses on Analog Electronic Circuits, Electrical Measurements, Computer Architecture and Organization.

COURSE DESCRIPTION:
Principle of operation, advantages and limitations of various types of electronic and digital instruments for measurement of electrical quantities; Storage oscilloscopes, Data acquisition,display devices and recorders.

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

CO1. demonstration knowledge on
- various types of electronic and digital instruments.
- signal analyzers and storage oscilloscopes.
- data acquisition systems, display devices and recorders.

CO2. analyze
- various types of electronic and digital instruments.
- signal analyzers and storage oscilloscopes.
- display devices, recorders and various data acquisition systems.

CO3. design an appropriate display system for industrial and commercial applications.

CO4. estimate the magnitude, phase, frequency and spec trum of signalwith oscilloscope to provide feasible solution.

CO5. selectan appropriate instrumentation principles and tech niques to substantiate the industrial requirements.

CO6. apply the conceptual knowledge of various instrumen tation principles and techniques in relevance to industry.

DETAILED SYLLABUS:

UNIT-I: ELECTRONIC INSTRUMENTS (10 periods)
Electronic voltmeter using rectifiers, AC voltmeter - Average, Peak and true RMS voltmeters; Electronic multi meters-electronic ohm meter; Vector impedance meter, Vector voltmeters, Q meter- measurement of low, high impedance and band width, errors.

UNIT-II: DIGITAL INSTRUMENTS (09 periods)
Basic digital instrument.Digital frequency meter - Period and Time interval measurement;Digital phase meter, Capacitance

meter, Digital Tachometer, Digital LCR meter, LCR Bridge, Characteristics of digital meters, specification of DVM, Digital multi meter. Microprocessor based ramp type DVM.

UNIT-III: SIGNAL ANALYZERS & STORAGE OSCILLOSCOPES (10 periods)

Analyzers-Resonant wave analyzers, Frequency-selective analyzers, Heterodyne analyzers, Application of wave analyzers; Harmonic distortion analyzers, Total Harmonic distortion analyzers, logic analyzers,Power analyzers.
Spectrum analyzers-basic spectrum analyzers, spectra of different signal.
Storage oscilloscope-Sampling oscilloscope, digital storage oscilloscope, electronic switch, oscilloscope probes.

UNIT-IV: DATA ACQUISITION SYSTEMS (09 periods)

Generalized data acquisition system and its components, Types of multiplexing systems - time division and frequency division multiplexing; Digital data acquisition system, use of data acquisition systems and recorders in digital systems, Digital recording systems -block diagram and its working; modern digital DAS-Analog Multiplexer operation, Operation of Sample- Hold circuits.

UNIT-V: DISPLAY DEVICES AND RECORDERS (07 periods)

Display devices-LED, LCD, LVD,VDU; Recorders- graphic, ultraviolet and magnetic tape recorders, digital tape recorders, biomedical recorders.

Total Periods: 45

TEXT BOOKS:

1. A.K.Sawhney, A course on *Electrical and Electronics Measurements & Instrumentation*, DhanpatRai and Co. Publishers,19th edition, 2015.
2. J.B. Gupta, A course on *Electrical and Electronics Measure ments & Instrumentation*, S.K. Kataria publishers, 14th edition, 2015.

REFERENCE BOOKS:

1. H. S. Kalsi, *Electronic Instrumentation*-by Tata MC Graw Hill Company, 3rd edition, 2010.
2. D.V.S Murthy, *Transducers and Instrumentation*, Prentice Hall of India, New Delhi, 2nd edition,2010.

III B.Tech.- II Semester

(16BT60210) **SPECIAL ELECTRICAL MACHINES**

(Program Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Course on Synchronous Machines

COURSE DESCRIPTION:
Construction, operation, types, characteristics and applications of Stepper Motors, Switched Reluctance Motor, PM Brushless DC Motor, Synchronous Reluctance, Linear Induction and synchronous Motors.

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

CO1. demonstrate knowledge on
- construction and operation of various types of special electrical machines.
- characteristics of special electrical machines.
- open loop and closed loop operation of special electrical machines.

CO2. analyze the operation and performance of special elec trical machines for various operating conditions.

CO3. design suitable accessories / controllers for desired op eration and control of special electrical machines.

CO4. solve engineering problems pertaining to special electri cal machines to provide feasible solutions.

CO5. selectand apply appropriate technique and tools for con trol and operation of special electrical machines in do mestic and industrial applications.

CO6. apply the conceptual knowledge of special electrical machinesin relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I:STEPPER MOTOR (09 periods)
Types of construction and working principle of stepping motor.Various configurations for switching the phase windings, torque equation and characteristics. Open loop and closed loop control of stepper motor, applications.

UNIT-II:SWITCHED RELUCTANCE MOTOR (09 periods)
Construction details, Principle of operation - Design of stator and rotor pole arcs - torque equation and characteristics, power converter for switched reluctance motor, control of switched reluctance motor, rotor sensing mechanism.

UNIT-III: SYCHRONOUS RELUCTANCE MOTOR (09 periods)
Constructional features, Types – Axial and Radial flux motors.

Principle of operation, torque-speed characteristics, Phasor diagram, Characteristics, control of SyRM, advantages and applications.

UNIT-IV:PERMANENT MAGNET BRUSHLESS DC MOTOR (09 periods)

Permanent magnet materials-hysteresis loop, analysis of magnetic circuits. Constructional details, principle of operation, BLDC square wave motor, types of BLDC motor, sensing and switching logic schemes, sensorless and sensor based control of BLDC motors.

UNIT-V:LINEAR MOTORS (09 periods)

Linear Induction Motor (LIM): Construction, principle of operation- single sided and double-sided LIM, thrust equations and performance equations based on current sheet concept, equivalent circuit of LIM, applications.

Linear Synchronous Motor (LSM): Construction, types, principle of operation, thrust equation, control and applications.

Total Periods: 45

TEXT BOOKS:

1. K. VenkataRatnam, *Special electrical machines*, University press, New Delhi, 2009.
2. E.G. Janardhanan, *Special electrical machines*, PHI learning private limited, 2014.

REFERENCE BOOKS:

1. Takashi Kenjo, *Stepping Motors and their Microprocessor controls*, clarenden press, Oxford, 1984.
2. T. Kenjo and S. Nagamori, *Permanent-Magnet and Brushless DC Motors*, clarenden press, Oxford, 1984.
3. T.J.E. Miller, *Brushless Permanent Magnet and Reluctance Motor Drives*, clarenden press, Oxford 1989.
4. R. Krishnan, *Switched Reluctance Motor Drives - Modeling, Simulation, analysis, Design and Applications*, CRC press, Special Indian Edition, 2015.

III B.Tech.- II Semester

(16BT60231) **POWER ELECTRONICS AND DRIVES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES: Courses on Transformers & Induction Machines and Power Electronics.

COURSE DESCRIPTION:
Characteristics of power switching devices; Triggering and commutation circuits of SCR; working of various power electronic converters and AC & DC drives.

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

CO1. demonstrate knowledge on characteristics of power switching devices, their triggering and commutation cir cuits, various converters and drives.
CO2. analyse physical observations and measurements of vari ous parameters related to powerswitching devicwes, converter circuitsand drives.
CO3. design, validate and applydifferent triggering and com mutation circuits for SCR.
CO4. interpret and synthesize the data obtained from experi mentation on power electronic devices / circuits / drives to provide valid conclusions.
CO5. select an appropriate power switching device and/or cir cuit for real time applications.
CO6. apply the conceptual knowledge of power semiconduc tor drives in relevance to industry and society.
CO7. commit to ethical principles and standards while exer cising the practical investigations on power electronics and drives.
CO8. work individually or in a group in the field of Powerelec-tronics and drives.
CO9. communicate effectively in verbal and written form in relevance to power electronics and drives.

DETAILED SYLLABUS:

PART-A:Any Seven of the experiments to be conducted from

PART-A.

1. Characteristics of SCRand TRIAC.
2. Characteristics of Power MOSFET and IGBT.
3. Gate firing circuits for SCR (R, RC and UJT).
4. Forced commutation circuits for SCR.
5. Single phase half and full controlled bridge converter with R and RL loads.

6. Three phase semi-controlled bridge converter with R and RL loads.
7. Single phase dual converter with RL loads.
8. DC Jones chopper with R and RL Loads.
9. Single phase AC voltage controller with R and RL Loads.
10. Single phase cycloconverter with R and RL loads.
11. Single phase parallel inverter with R and RL loads.

PART-B:Any Three of the experiments to be conducted from

PART-B.

1. Speed control of separately excited DC motor using single phase full converter.
2. Four quadrant chopper fed DC drive.
3. Speed control of single phase induction motor using cycloconverter.
4. Three phase fully controlled rectifier fed separately excited DC motor.
5. Speed control of single phase induction motor using IGBT based PWM inverter.

III B.Tech.- II Semester
(16BT60232) **POWER SYSTEM - I LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES:Course on Transmission &Distribution and Power System Analysis.

COURSE DESCRIPTION:
Experimentation on Transmission and distributionsystems; Load flow, Fault and Stability analysis.

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

CO1. demonstrate knowledge on transmission & distribution systems and various types of power system analysis for experimental implementation.
CO2. analyze, evaluate and relate experimental observations and measurements for validation.
CO3. design a suitable measuring and testing setup for ex perimentation on power systems.
CO4. interpret the data obtained from experimentation to pro vide valid conclusions
CO5. select and apply appropriate technique for solving com plex problems in the power systems.
CO6. apply the conceptual knowledge of power systems in relevance to industry and society
CO7. commit to ethical principles and standards while exer cising the practical investigations on power system.
CO8. work individually or in a group while exercising practical investigationsin the field of power system analysis.
CO9. communicate effectively in verbal and written form in relevance to power system.

DETAILED SYLLABUS:
Conduct any **TEN** exercises from the following

1. Determination of transmissionline parameters.
2. Performance of a transmission line for different load conditions.
3. Corona characteristics.
4. Determination of efficiencyof string insulator.
5. Power angle characteristicof salient pole synchronous machine.
6. Performance characteristics of distribution system.
7. Formation of Ybus.
8. Formation of Zbus
9. Load flow analysis.

10. Fault analysis.
11. Rotor dynamics using swing equation.
12. Transient stability analysis.

III B.Tech.- II Semester
(16BT60233) **SEMINAR**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
--	100	100	--	--	--	2

PREREQUISITES:
All the courses of the program up to III B. Tech. - I Semester.

COURSE DESCRIPTION:
Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES:
Completion of the seminar work enables a successful student to demonstrate:

CO1. Knowledge on the seminar topic.
CO2. Analytical ability exercised during the seminar work.
CO3. Ability to investigate and solve complex engineering problems faced during the seminar work.
CO4. Ability to apply techniques to complex engineering activities with an understanding of limitations as applied in the seminar work.
CO5. Ability to function effectively as an individual as experienced during the seminar work.
CO6. Ability to present views cogently and precisely on the seminar topic.
CO7. Ability to engage in life-long leaning as experience during the seminar work.

IV B.Tech - I Semester

(16BT70201) **POWER SYSTEM OPERATION AND CONTROL**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Transmission & Distribution and Control Systems.

COURSE DESCRIPTION:
Load forecasting; Optimal operation of generators in thermal power station; Optimal scheduling of hydrothermal system; Unit commitment; Modeling of Power system components; Reactive power and Voltage control; Load frequency control.

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

CO1. demonstrate knowledge on:
- load forecasting methods.
- characteristics, scheduling and optimal operation of thermal and hydro power plants
- unit commitment.
- modeling of power system components for LFC and AVR studies.
- concepts of reactive power and voltage control.
- load frequency control in single - and two-area sys tems.

CO2. analyze
- the criteria for optimal operation of thermal and hydro thermal plants with and without transmission losses.
- unit commitment of thermal units.
- compensation and tap settings required for reactive power and voltage control
- LFC parameters in single - and two-area power sys tem.

CO3. design suitable strategy to control reactive power, volt age and LFC dynamics in power system.

CO4. evaluate various operational parameters for scheduling & economic operation and control of power system to provide viable solution.

CO5. apply appropriate tools and techniques for secured op eration and control of power system.

CO6. apply the conceptual knowledge of power system op eration and control in relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I: PLANNING AND ECONOMIC OPERATION OF THERMAL POWER SYSTEM (12 Periods)

Planning: Load curves, importance of load forecasting, quadratic, simple regression and exponential curve fitting techniques of forecasting.

Economic Operation of thermal plants: Characteristics of thermal plants. Optimum allocation with and without transmission losses, loss coefficients, general transmission line loss formula.

UNIT-II: HYDROTHERMAL SCHEDULING (07 Periods)

Introduction, classification of hydro plants, scheduling of hydro plants - long-term, short-term, scheduling energy.Hydrothermal scheduling - problem formulation, objective function, operational constraints. Short term scheduling - Lagrange function, iteration method, penalty factor.

UNIT-III: UNIT COMMITMENT (07 Periods)

Unit commitment Vs Economic dispatch.Constraints in unit commitment - start-up and shut-down costs, up time and down time. Unit commitment solution methods - priority list method, dynamic Programming method (maximum of three plants for three operating hours only).

UNIT-IV: REACTIVE POWER AND VOLTAGE CONTROL (08 Periods)

Introduction, reactive power and voltage control in transmission lines - Line compensation, Load compensation and Static compensation. Voltage control methods - Excitation systems - AC, DC and Static types. Tap-changing transformers. Components and block diagram representation of IEEE type-1 excitation system, AVR model.

UNIT-V: LOAD FREQUENCY CONTROL IN POWER SYSTEM (12 Periods)

Load frequency control of single area system: Necessity of keeping frequency constant, LFC Model - speed governor, turbine - reheat and non-reheat, generator-load model. steady state response - uncontrolled and controlled case, dynamic response. Load frequency control and economic dispatch control.

Load frequency control of two area system: Block diagram representation, uncontrolled and controlled case, tie-line bias control. State space representation and optimal controller.

Total Periods: 45

TEXT BOOKS:

1. K. Uma Rao, *Power system operation and control*, Wiley India Pvt. Ltd, 1st edition, 2013.
2. A. Chakravarthi and S. Halder, *Power System Analysis Operation and Control*, Prentice Hall India, 3rd edition, 2006.

REFERENCE BOOKS:

1. C.L.Wadhwa, *Electrical Power Systems*, New age Interna tional, New Delhi, 5th edition, 2009.
2. Wood, Allen J., and Bruce F. Wollenberg, *Power generation, operation and control*, John Wiley & Sons, 3rd edition, 2013.
3. PrabhaKundur, P*ower system stability and control*, Mc Grawhill, 1st edition, 2006.
4. T.J.E. Miller, *Reactive Power control in electric systems*, Wiley, 1982.

IV B. Tech. - I Semester

(16BT70402) **EMBEDDED SYSTEMS**

(Common to EEE, ECE and CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:
Courses on Switching Theory and Logic Design and Computer Architecture and Organization

COURSE DESCRIPTION:
Embedded system design approaches; MSP430 Architecture; Instruction Set; On-Chip Resources; Programming; Communication with peripherals; Internet of Things related Issues.

COURSE OUTCOMES: On successful completion of the course, student will be able to

CO1. demonstrate knowledge in
- MSP430 Architecture, Pin out, Instruction set
- High level programming
- Usage of On-chip resources like ADC, DAC, Timers
- Internet of Things related issues

CO2. analyze various design issues regarding
- Usage of on chip resources
- Low power modes
- Communication support

CO3. design embedded systems using MSP430 series microcontrollers to suit market requirements.

CO4. solve engineering problems and arrive at solutions in de signing embedded systems to support interconnectivity.

CO5. apply techniques, program skills, On-Chip resources to design networked embedded systems with an under standing of limitations.

CO6. reason out and practice professional engineering to de liver efficient and cost effective embedded based prod ucts to society.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO EMBEDDED SYSTEMS (09 periods)

Embedded Systems - Definition, Approaches, Applications, Anatomy of microcontroller, Memory, Software; MSP430 Introduction- Pin out, Functional Block diagram, Memory, CPU, Memory mapped input and output, Clock generator; Exceptions- Interrupts and Resets.

UNIT-II: ARCHITECTURE OF MSP430 (09 periods)

CPU, Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Example programs, Reflections on

CPU and Instruction set, Resets, Clock System.

UNIT-III: FUNDAMENTALS FOR PROGRAMMING (09 periods)

Development Environment, C Programming Language, Assembly Language, Programming and Debugging, Sample programs- Light LEDs in C, Read input from a switch; Automatic Control-Flashing light by delay, use of subroutines, using Timer_A; Header files and issues, Functions, Interrupts and Low power modes.

UNIT-IV: TIMERS, MIXED SIGNAL SYSTEMS AND COMMUNICATION (09 periods)

Timers - Watchdog Timer, RTC, Measurement in capture mode; Mixed-Signal Systems- Comparator_A, ADC10 Architecture & operation, ADC12, Sigma-Delta ADC Architecture & operation, DAC; Communication- Communication Peripherals in MSP430, SPI, Inter-integrated Circuit Bus, Asynchronous communication with the USCI_A.

UNIT-V: HARDWARE SOFTWARE CO-DESIGN AND INTERNET OF THINGS (09 periods)

CO-Design Issues: Co-design Models, Architectures, Languages, a Generic Co-design Methodology.
IOT: Introduction, Origins, Drivers and Applications, IOT Communication Models - Device to Device, Device to Cloud, Device to Gateway, Back end Data Sharing Model; IPV6 and IOTs', IOT Issues, Security Issues-challenges; Privacy Considerations, Interoperability/Standards.

Total Periods: 45

TEXT BOOKS:

1. John H. Davies, *MSP430 Microcontroller Basics*, Newnes Publications, 2008.
2. Karen Rose, Scott Eldridge, Lyman Chapin, T*he Internet of Things: An Overview: Understanding the Issues and Challenges of a More Connected World*, Internet Society, Oct, 2015.
3. Jorgen *Staunstrup, Wayne Wolf, Hardware / software co-design Principles and Practice*, Springer, 2009.

REFERENCE BOOK:

1. Chris Nagy, *Embedded Systems Design using the TI MSP30 Series*, Newnes Publications, 2003.

IV B.Tech. - I Semester

(16BT70202) **SWITCHGEAR AND PROTECTION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Transformers and Induction Machines, Synchronous Machines and Transmission & Distribution.

COURSE DESCRIPTION:
Overview of protection schemes; Fuses and circuit breakers; Electromagnetic, static and microprocessor based relays; Protection schemes for various components under various operating conditions; Neutral grounding.

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

CO1. demonstrate knowledge on
- operation of various protective devices and schemes.
- protection principles for power system components.
- neutral grounding.

CO2. analyzedifferent protective devices and protection schemes under various operating conditions.

CO3. designproper protection scheme for different power system components.

CO4. evaluateoperating parameters and settings of protective devices in different protection schemes to provide feasible solutions.

CO5. select and apply appropriate protective device and scheme for different scenarios.

CO6. apply various grounding methods for safety of power system components and personnel.

DETAILED SYLLABUS:

UNIT-I: RELAYS (11 periods)

Electromagnetic relays: Introduction, types of relays, construction, operation and torque equation of induction type relays, differential relays and biased differential relays. Characteristics of over current, directional and distance relays (R-X).

Static relays: Advantages and disadvantages, block diagram of a basic static relay, definite time, inverse and inverse definite minimum time (IDMT) static relays. Comparators - amplitude and phase comparators.

Microprocessor based relays: Advantages and disadvantages, block diagram with flow chart - distance relays and over current relays - definite, inverse & IDMT.

UNIT-II: FUSES AND CIRCUIT BREAKERS (09 periods)

Fuses - types of fuses & characteristics. Circuit breakers -

elementary principles of arc interruption, recovery voltage, restriking voltage, RRV, average and maximum rate of rise of restriking voltage, current chopping and resistance switching. Construction and principle of operation - minimum oil circuit breaker, air blast circuit breaker, vacuum circuit breaker and SF_6 circuit breaker. Isolators.

UNIT-III: PROTECTION OF GENERATORS AND TRANSFORMERS (08 periods)

Protection of generators: Differential protection, restricted earth fault protection and inter turn fault protection, rotor fault protection, calculation of percentage winding unprotected.
Transformer protection: Differential protection, percentage differential protection, design of CT's ratio. Protection against internal faults - buchholtz relay.

UNIT-IV: PROTECTION OF FEEDERS AND TRANSMISSION LINES (10 periods)
Protection of transmission lines: Three-zone distance protection using distance relays, carrier current protection using over current relays.
Protection of feeders: Protection of radial and ring main feeders using over current relays. Protection of bus bars.
Protection against Over Voltages: Causes of over voltages in power systems, protection against lightning over voltages - non-linear (valve type) and metal oxide (zinc-oxide) surge arresters, surge absorbers. Insulation coordination, basic impulse insulation level (BIIL).

UNIT-V: NEUTRAL GROUNDING (07 periods)
Grounded and ungrounded systems.Effects of ungrounded neutral on system performance. Methods of neutral grounding - solid, resistance, reactance, arc suppression coil (Peterson coil), grounding practices.

Total Periods: 45

TEXT BOOKS:

1. Sunil S. Rao, *Switchgear Protection and Power Systems (Theory, practice and Solved Problems)*, Khanna Publishers, New Delhi, 13th edition, 2013.
2. Badri Ram, D. N. Viswakarma, *Power system Protection and Switchgear*, Mc Graw Hill education (India) Private Limited, New Delhi, 2nd edition, 2011.

REFERENCE BOOKS:

1. C. L. Wadhwa, *Electrical Power systems*, New Age International (P) Limited, Publishers, New Delhi, 5th edition, 2009.
2. T. S. Madhava Rao, *Power System Protection: Static Relays with Microprocessor Applications*, Tata Mc Graw-Hill Publishing Company Limited, New Delhi, 2nd edition, 2004.

IV B.Tech. - I Semester

(16BT70203) **ENERGY CONSERVATION AND MANAGEMENT**

(Program Elective-3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Electrical Measurements and Transmission & Distribution.

COURSE DESCRIPTION:
Principles of energy conservation, audit and management; Energy efficient motors, lighting, instruments and significance of energy economics.

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

CO1. demonstrate knowledge on
- energy auditing practices.
- energy conservation schemes.
- energy economics and management.

CO2. analyze
- energy conservation measures.
- energy auditing practices.
- energy economics and management.

CO3. design an appropriate energy conservation scheme for commercial and industrial applications.

CO4. explore relevant methods of energy auditing in various industries and provide feasible solutions to conserve energy.

CO5. select and apply appropriate technique for energy au diting and conservation.

DETAILED SYLLABUS:

UNIT-I: ENERGY AUDIT AND MANAGEMENT PRINCIPLES (10 periods)
Energy audit - definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, energy conservation schemes - energy audit of industries - energy saving potential, energy audit of process industry, thermal power station, building energy audit.
Energy management- Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting.

UNIT-II: ENERGY CONSERVATION PRINCIPLES (08 periods)
Rules for efficient energy conservation - technologies for

energy conservation - Energy scenario, principles of energy conservation, resource availability, energy savings, current energy consumption in India, roles and responsibilities of energy managers in industries.

UNIT-III: ENERGY EFFICIENT MOTORS AND LIGHTING (09 periods)

Energy efficient motors - factors affecting efficiency, loss distribution, constructional details, characteristics, variable speed, variable duty cycle systems, motor energy audit.
Lighting: Good lighting system design and practice, lighting control, lighting energy audit.

UNIT-IV: ENERGY INSTRUMENTS AND ECONOMIC ANALYSIS (08 periods)

Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.PLCs and applications.
Energy Economic Analysis - The time value of money concept. Cash flow models, payback analysis, depreciation, taxes and tax credit - numerical problems.

UNIT-V: DEMAND SIDE MANAGEMENT (10 periods)

Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM - time of day pricing, multi-utility power exchange model, and time of day models for planning. Load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and organization of energy conservation awareness programs.

Total Periods: 45

REFERENCE BOOKS:

1. W.R. Murphy & G. Mckay Butter worth, *Energy management*, Butter worth-Heinemann publications, 2nd edition, 2016.
2. Albert Thumann, William J. Younger, *Handbook of energy audits*, Taylor & Francis Ltd, 7th edition, 2008.
3. UmeshRathore, *Energy management*, S.K. Kataria & Sons, 2nd edition, 2014.
4. W.C.Turner,Steve doty, *Energy management hand boo*k, CRC press, 6th edition, 2006.
5. D.P. Sen, K.R. Padiyar, IndraneSen, M.A. Pai, *Recent Ad vances in Control and Management of Energy Systems*, In terline Publisher, Bangalore, 1993.
6. Ashok V. Desai, Wiley Eastern, *Energy Demand - Analysis, Management and Conservation Hand book on energy auditing - TERI (Tata Energy Research Institute)*, 2005.
7. Craig B. Smith, Kelly E. Parmenter, *Energy management prin ciples Applications*, benefits, Savings, Elsevier Inc(Pergamon Press), 1st edition, 2016.

8. Dale R. Patrick, Stephen W. Fardo, Ray E. Richardson, Steven R. Patrick, *Energy Conservation guide book*, Taylor & Francis Ltd, 2nd edition, 2007.
9. Ashok V. Desai, *Energy Economics*, Wiley Eastern, 1st edition, 1990.
10. Industrial *Energy Conservation Manuals*, Cambridge, MIT Press, 1982.
11. Frank Kreith, Ronald E. West, H*andbook of Energy Efficiency*, CRC Press, 1st edition, 1996.

IV B.Tech. - I Semester

(16BT70204) **FLEXIBLE AC TRANSMISSION SYSTEMS**

(Program Elective-3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Power Electronics and Transmission & Distribution.

COURSE DESCRIPTION:
Conventional AC Power Transmission System; Real and Reactive Power Transmission; load and line compensation; Concepts of FACTS; Compensation using FACTS Devices and Controllers; Shunt Compensation, Series Compensation, Phase angle Regulation and Combined compensation.

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

CO1. demonstrate knowledge on
- real and reactive power flow in conventional system.
- concept of FACTS devices and controllers.
- shunt and series compensation using FACTS devices.
- phase angle regulation and combined compensation.

CO2. analyze
- stability and voltage profile of a compensated and un compensated transmission lines.
- Voltage regulation, improvement of transient stability, prevention of voltage instability, power oscillation damp ing with various FACTS devices and controllers.

CO3. design suitable compensation strategy for better volt age profile and secured operation of power system.

CO4. solve problems of transmission system to provide fea sible solutions.

CO5. select and apply appropriate devices, schemes and tech niques for real time applications in AC power transmission.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO AC TRANSMISSION SYSTEMS (10 Periods)

Overview of interconnected power system. Power flow in AC systems - Expression for real and reactive power flow between two nodes of a power system, controllable parameters, conventional controllers for real and reactive power flows - merits and demerits.
FACTS - benefits - types of FACTS controllers.

UNIT-II: REACTIVE POWER CONTROL (09 Periods)
Reactive power - it's significance and control in Electrical Power Transmission - Different types of reactive power compensation equipment for transmission systems. Load compensation - specification of load compensator. Uncompensated and compensated transmission lines: shunt and series compensation.

UNIT-III: STATIC SHUNT COMPENSATION (11 Periods)
Operating characteristics and control schemes of static VAR generators - variable impedance type: TCR, TSR, TSC, Switching converter type - STATCOM; Hybrid VAR generators. Applications of static shunt compensators - Voltage regulation, improvement in transient stability, prevention of voltage instability, power oscillation damping. Comparison of static shunt compensators.

UNIT-IV: STATIC SERIES COMPENSATION (08 Periods)
Operating characteristics and control schemes of static VAR generators - variable impedance type: GCSC, TSSC, TCSC, Switching converter type: SSSC. Applications of static series compensators - improvement in transient stability, power oscillation damping. Comparison of static series compensators.

UNIT-V: STATIC PHASE ANGLE REGULATORS AND COMBINED COMPENSATORS (07 Periods)
Power flow control by phase angle regulators - operation and control of TCPAR, objectives of TCPAR: improvement of transient stability, power oscillation damping. Principle of UPFC - comparison of UPFC to series compensators and phase angle regulators, control schemes of UPFC, operating principle and characteristics of IPFC.

Total Periods: 45

TEXT BOOKS:

1. T.J.E. Miller, *Reactive Power control in electric systems*, Wiley, 1982.
2. Narain G. Hingorani, LasziGyugyi, *Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems*, Wiley-IEEE Press, 1999.

REFERENCE BOOKS:

1. Xiao-Ping, Rehtanz, Christian, Pal, Bikash, *Flexible AC Transmission Systems: Modeling and Control, Springer Power Systems Series*, 2006.
2. R. Mohan Mathur and Rajiv K. Varma, *Thyristor based FACTS controllers for Electrical Transmission Systems*, Wiley-IEEE Press, 2002.

IV B.Tech. - I Semester

(16BT70205) **POWER SYSTEM AUTOMATION**

(Program Elective-3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Course on Switchgear and Protection.

COURSE DESCRIPTION:
Power system operation and control, Substation and Distribution automation; Deregulation and Restructuring of power system.

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

CO1. demonstrate knowledge on
- real time operation and control of power system.
- substation and distribution automation.
- restructuring of power system.

CO2. analyze
- various automation devices.
- technical issues.
- restructured model of power system.

CO3. design a suitable architecture for substation automa tion.

CO4. examine operational and technical issues to provide fea sible solutions for substation and distribution automa tion.

CO5. apply principles of DMS framework to integrate with real time power system.

CO6. apply the conceptual knowledge of real time operation and control of power system in relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I: POWER SYSTEM CONTROL (08 periods)
Introduction, Decomposition, Operation of power systems, organization and operator activities, Investment factor, Control centre, elements of computer control system.

UNIT-II: POWER SYSTEM AUTOMATION (10 periods)
Evolution of automation systems, SCADA in power system, Building blocks of SCADA system, Remote terminal unit, Intelligent electronic devices, Data concentrators and merging units, SCADA communication systems, Master station, Human-machine interface, Classification of SCADA systems.

UNIT-III: SUBSTATION AUTOMATION (09 periods)
Substation automation, conventional automation, New smart devices for substation automation, new integrated digital substation, technical issues, new digital simulation. Substation automation architectures, Substation automation applications functions, Benefits of data warehousing.

UNIT-IV: DISTRIBUTION AUTOMATION (08 periods)
Introduction to Distribution automation - Customer, Feeder and substation automation, Subsystems in a distribution control center, Distributed Management System(DMS) framework integration with subsystems, Advanced real-time DMS applications, advanced analytical DMS applications, DMS coordination with other systems.

UNIT-V: POWER SYSTEM RESTRUCTURING (10 periods)
Deregulation- need for deregulation, Advantages of deregulation in power system; Restructuring Models- PoolCo Model, Bilateral Model, Hybrid Model; Independent system operator (ISO) - Role of ISO; Power exchange, Market operations, Market power, Standard cost, Transmission pricing, Congestion pricing - management of congestion.

Total Periods: 45

TEXT BOOKS:

1. Torstencegrell, *Power systems control Technology*, Prentice Hall, 1986.
2. Mini S Thomas and John D Mcdonald, *Power System SCADA and Smart Grids*, CRC Press, 2015.
3. M Shahidehpour, MuwaffaqAlomoush, *Restructured electrical power systems operation*, trading and volatility, CRC Press, 2001.

REFERENCE BOOKS:

1. James Northcote-Green and Robert Wilson, *Control and Automation of Electrical Power Distribution Systems*, CRC Press, 2013.
2. Edmund Handschin, *Real time control of Electric Power System*, Elsevier Publishing company, 1972.

IV B.Tech. - I Semester

(16BT70206) **POWER SYSTEM RELIABILITY**

(Program Elective-3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses onMulti-variable Calculus & Differential Equations and Transmission & Distribution.

COURSE DESCRIPTION:
Overview of Probability theory; Study of network modelling and reliability functions; Assessment of repairable systems; Evaluation of generation system reliability, estimation of distribution system reliability indices.

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

CO1. demonstrate knowledge on
- elements of probability theory and probability distributions.
- types of failures, reliability block diagram reductions.
- network reduction techniques and Markov modelling.
- loss of generation, frequency and duration techniques.
- distribution system reliability indices.

CO2. analyze
- various probability distributions.
- the network reduction techniques and Markov modelling.
- frequency and duration techniques.
- loss of generation, customer, load and energy oriented indices.

CO3. design component/system for desired life expectancy and reliability.

CO4. investigate various reliability indices and evaluate the power system performance to provide feasible solutions.

CO5. select and apply appropriate mathematical tool for assessment of power system reliability indices.

CO6. apply the conceptual knowledge of reliability engineering and its applications in relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I: PROBABILITY THEORY (09 periods)

Introduction - rules for combining probabilities of events - bernoulli's trials, probability density and distribution functions. **Probability Distributions** - discrete distributions - binomial

distribution, poisson distribution. Continuous distributions - exponential distribution, weibull distribution and normal distribution - mean, standard deviation, variance.

UNIT-II: RELIABILITY FUNCTIONSAND NETWORK MODELLING (10 periods)

Reliability functions f(t), F(t), R(t), ?(t) and their relationships, bath tub curve. Reliability measures - MTTF, MTTR, MTBF. Reliability economics. Reliability block diagrams - series, parallel systems and combined series-parallel systems.Reliability analysis of series parallel networks using exponential distribution.Reliability evaluation of non-series-parallel systems - decomposition method, cut-set and tie-set method. Concept of redundancy - standby redundant systems, perfect switching, imperfect switching.

UNIT-III:MARKOV MODELLING & FREQUENCY AND DURATION TECHNIQUES (10 periods)

Markov chain - concept of stochastic transitional probability matrix (STPM), evaluation of limiting state probabilities. Markov processes - time dependent probability evaluation - evaluation of limiting state probabilities using STPM - one, two component repairable models. Frequency and duration concept - evaluation of frequency of encountering state for one, two component repairable models - evaluation of cumulative probability and cumulative frequency of encountering of merged states.

UNIT-IV:GENERATION SYSTEM RELIABILITY ANALYSIS (08 periods)

Generation system reliability analysis - reliability model of a generation system - recursive relation for unit addition and removal. Load modelling - merging of generation load model - evaluation of transition rates for merged state model - cumulative probability, cumulative frequency of failure evaluation - LOLP, LOLE, LOEE.

UNIT-V:DISTRIBUTION SYSTEM RELIABILITY ANALYSIS (08 periods)

Distribution system reliability analysis - radial networks - evaluation of basic reliability indices, performance indices - customer oriented, load and energy oriented indices and application to radial systems - effect of lateral distributor protection, disconnects and protection failure.

Total Periods: 45

TEXT BOOKS:

1. Roy Billinton and Ronald N Allen, *Reliability Evaluation of Engineering Systems*, Springer, 2nd edition, 2007.
2. Roy Billinton and Ronald N Allen, *Reliability Evaluation of Power Systems*, Springer, 2nd edition, 2007.

REFERENCE BOOKS:

1. V. Sankar, *System Reliability Concepts*, Himalaya Publishing House, 1st edition. 2015.
2. Charles E. Ebeling, *An Introduction to Reliability and Maintainability Engineering*, Tata McGraw-Hill, 2nd edition, 2000.

IV B.Tech. - I Semester

(16BT70207) **ANALYSIS OF POWER ELECTRONIC CONVERTERS**

(Program Elective-4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on Electrical Circuits, Electronic Devices & Circuits, Analog Electronics Circuits, Linear and Digital ICs and Power Electronics.

COURSE DESCRIPTION:
Advanced Power semiconductor devices; MOSFET and IGBT-Gate and base drive circuits; 3-, 6- and 12- pulse converters; Switching Regulators; Advanced PWM Techniques.

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

CO1. demonstrate knowledge on the characteristics of various special power switching devices & various triggering methods for MOSFET and IGBT.
CO2. analyze the performance of different power converters subjected to various loads.
CO3. design the suitable switching regulators for appropriate power electronic applications.
CO4. examine various configurations of power electronic circuits to provide feasible solutions.
CO5. select an appropriate power semiconductor device and/or circuit for real time applications.
CO6. apply the conceptual knowledge of power semiconductor devices and/or circuits in relevance to industry.

DETAILED SYLLABUS:

UNIT-I: SPECIAL POWER SWITCHING DEVICES (10 periods)

Thyristors: GTOs - Construction, operation, steady state characteristics and switching characteristics. Construction and operation of BCTs, FET - CTHs, ETOs, IGCTs, MCTs, SITHs, ASCR, RCT, SCS and light activated thyristor. Comparison of various thyristors.
Transistors: Construction and operation of COOLMOS and SITs.

UNIT-II: GATE & BASE DRIVE CIRCUITS (10 periods)

MOSFET and BJT gate drive circuits. Isolation of gate and base drives - pulse transformer, opto-couplers. Thyristor firing circuits - R, RC firing circuits, photo - SCR isolator, pulse transformer isolation, 1:6 isolation transformer for inverter gate bias

circuits and thyristor converter gating circuits. Gate drive ICs - MOSFETs and IGBTs. Drive ICs for converters - MOS Gated Driver.

UNIT-III: ANALYSIS OF MULTIPULSE CONVERTERS (09 periods)

Operation of 3-, 6-, and 12- pulse converters. Performance analysis of 3-, 6-, and 12- pulse converters - Low Order Harmonics (LOH), Total Harmonic Distortion(THD), Power Factor, Ripple Factor, Form Factor, Distortion Factor.

UNIT-IV: SWITCHING REGULATORS (08 periods)

Design and analysis of buck, boost, buck-boost and cuk converters.Resonant Converters-Zero Voltage Switching (ZVS) and Zero Current Switching (ZCS) converters.

UNIT-V: ADVANCED PWM TECHNIQUES (08 periods)

Modified Sinusoidal Pulse Width Modulation, Phase Displacement Control, Trapezoidal Modulation Technique, Staircase Modulation, Stepped Modulation, Harmonic Injection Modulation, Delta Modulation. Selective Harmonics Elimination (SHE) Technique.

Total Periods: 45

TEXT BOOKS:

1. Muhammad H. Rashid, *Power Electronics: Circuits, Devices and Applications*, Pearson Education, 4th Edition, 2013.
2. Ned Mohan, T. M. Undeland, W.P. Robbins, *Power Electronics: Converters, Applications and Design*, Wiley, 3rd Edition, 2007.

REFERENCE BOOKS:

1. P C Sen , *Modern Power Electronics*, Wheeler publishing Co, 1st Edition , New Delhi, 1998.
2. Bimal K Bose, *Modern Power Electronics and Drives*, Pearson Education, 2nd Edition, 2003.

IV B.Tech. - I Semester

(16BT70208) **POWER QUALITY**

(Program Elective-4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Course on Transmission and Distribution

COURSE DESCRIPTION:
Power quality terminology, power quality issues, classification; Different sources of power quality disturbances; Harmonic distortion; Principles for controlling harmonics; Power quality measuring equipment; Power quality monitoring standards; Impact of distributed generation on power quality.

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

CO1. demonstrate knowledge on
- sources of power quality disturbances and issues.
- power quality monitoring and measuring instruments.
- power quality standards.
- effect of distributed generation on power quality.

CO2. analyze various power quality issues.

CO3. design a suitable harmonic filter for commercial and in dustrial loads.

CO4. investigate various power quality issues and provide fea sible solutions for improvement of power quality.

CO5. selectand use an appropriate equipment for monitoring and measurement of power quality.

CO6. apply the conceptual knowledge of power quality in rel evance to industry and society.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO POWER QUALITY (08 periods)
Power Quality- definition, terminology, issues, evaluation procedure, responsibilities of the suppliers and users of electric power, power quality standards, CBEMA and ITI curves.

UNIT-II: POWER QUALITY DISTURBANCES (10 periods)
General classes of power quality problems- Impulsive and oscillatory transients. Long duration voltage variations - over voltage, under voltage, sustained interruption. Short duration voltage variations-interruption, sag, swell and outage. Sources of sags and interruptions, estimating voltage sag performance - overview of mitigation methods.

UNIT-III: FUNDAMENTALS OF HARMONICS (10 periods)
Harmonic distortion, voltage versus current distortion, harmonics versus transients, power system quantities under non-sinusoidal conditions, harmonic indices.Harmonic sources from commercial and industrial loads.Effects of harmonic distortion. Applied harmonics - harmonic distortion evaluation, principles of controlling harmonics, devices for controlling harmonic distortion. Harmonic filter design and standards on harmonics.

UNIT-IV: POWER QUALITY MONITORING (09 periods)
Power quality benchmarking, monitoring considerations, choosing monitoring locations, permanent power quality monitoring equipment, historical perspective of power quality measuring instruments. Power quality measurement equipment-types of instruments, assessment of power quality measurement data, power quality monitoring standards.

UNIT-V: DISTRIBUTED GENERATION AND GRID INTERCONNECTION (08 periods)
Distributed generation -connection requirements and impacts on the network.Interaction and optimal location of DG-Eigen analysis and voltage interaction.Power quality in DG-Mitigation of voltage dip during motor start, harmonic effects with DG, voltage flicker and fluctuation. Islanding issues, distribution line compensation-heavy Load and Light load condition, real generation, protection issues for distributed generation, technologies for distributed generation, power quality impact from different DG types.

Total Periods: 45

TEXT BOOKS:

1. Roger C. Dugan, Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty, *Electrical Power Systems Quality*, 3rd edition, TMH Education Pvt. Ltd., 2012.
2. ArindamGhosh, Gerard Ledwich, *Power quality enhancement using custom power devices*, Kluwer academic publishers, 2002.

REFERENCE BOOKS:

1. G.T. Heydt, *Electric Power Quality*, Stars in a circle Publications, 1991. USA.
2. Surajit Chattopadhyaya, Madhuchhanda Mitra, Samarjit Senugupta, *Electrical Power Quality*, Springer Dordrecht Heidelberg London New York.
3. Math H. J. Bollen, *Understanding Power quality problems,* IEEE Press, 2007.

IV B.Tech. - I Semester

(16BT70209) **SMART GRID TECHNOLOGY**

(Program Elective-4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Course on Transmission and Distribution

COURSE DESCRIPTION:
Smart grid benefits and requirements; Distribution management systems, smart substations, energy management systems; Smart meters and AMI; Power quality in smart grids; Communication channels and networks.

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

CO1. demonstrate knowledge on
- smart grid initiatives and technologies
- communication technologies for the smart grid
- sensing, measurement, control and automation.

CO2. analyze different communication channels and networks in smart grid.

CO3. use modern techniques/tools to convert conventional grid to smart grid.

CO4. apply principles of energy management systems to in dustrial applications.

CO5. follow the protocols and standards for communication technologies.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO SMART GRID (07 periods)
Smart Grid - Key requirements, operations, key features, challenges - technical and non-technical, comparison between smart grid and conventional grid. Concept of smart grid, need for smart grid and smart grid drivers. Functions and benefits of smart grid.Smart grid deployment in India.Functional model of a smart grid.

UNIT-II: TECHNOLOGIES FOR TRANSMISSION AND DISTRIBUTION SYSTEMS (12 periods)
Distribution system topology. Distribution system tools - Remote terminal unit (RTU) and its architecture; Distribution Management System (DMS) - functions, features and applications; Voltage/VAR control - devices, fault detection, isolation and service restoration; Outage management systems.
Smart substation - functions, features, substation automation, wide area monitoring system (WAMS); Feeder automation -

functions. Energy management systems - benefits, functions, duality between DMS and EMS.

UNIT-III: SMART METERS AND ADVANCED METERING INFRASTRUCTURE (09 periods)

Smart electricity meters - evolution, need for smart meter, benefits, differences between conventional and smart meter, hardware used; Advanced metering infrastructure (AMI) - benefits, drivers, system model, security requirements, AMI Vs AMR; Communication infrastructure and protocols for smart metering - Home area network (HAN), Neighbourhood area network (NAN) - protocols and standards for communication; Intelligent Electronic Devices (IEDs) - functions, Smart meter issues.

UNIT-IV: POWER QUALITY MANAGEMENT IN SMART GRID (07 periods)

Introduction to power quality, Electromagnetic compatibility (EMC) in smart grid, Grid connected renewable energy sources - equipment required, power quality conditioner; Web based power quality monitoring - hardware and software. Power quality audit.

UNIT-V: HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS (10 periods)

Introduction, communication channels - wired and wireless, wired Vs wireless; Networks used in communication - LAN, WAN, HAN, FAN, NAN, IAN, BAN; Communication technologies - Internet protocol, introduction to cloud computing and properties.

Total Periods: 45

TEXT BOOKS:

1. Bharat Modi, AnuPrakash and Yogesh Kumar, *Fundamentals of Smart Grid Technology*, S.K.Kataria& Sons, 2016.
2. JanakaEkanayake, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, Nick Jenkins, *Smart Grid Technology and Applications*, Wiley Publications, 2012.

REFERENCE BOOKS:

1. James Momoh, Smart Grid: *Fundamentals of Design and Anal sis*, Wiley, IEEE Press, 2012.

IV B.Tech. - I Semester

(16BT70210) **SOFT COMPUTING TECHNIQUES**

(Program Elective-4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: Courses on DC Machines and Transmission and Distribution.

COURSE DESCRIPTION:
Architectures of artificial neural networks; Learning strategies; Fuzzy set theory; Fuzzy systems design; Applications of neural networks and fuzzy systems; Genetic algorithms and its applications.

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

CO1. demonstrate knowledge on
- learning rules, strategies and algorithms of artificial neural network.
- fuzzy logic system.
- genetic algorithms.

CO2. analyze
- learning methods and algorithms of neural networks.
- fuzzy& classical sets.
- operators of genetic algorithms.

CO3. design fuzzy systems, neural networks and genetic al gorithms for desired specifications.

CO4. evaluate electrical engineering problems using soft com puting techniques to provide feasible solutions.

CO5. select and apply suitable soft computing techniques to solve electrical engineering problems.

CO6. apply the conceptual knowledge of soft computing tech niques in relevance to industry and society.

DETAILED SYLLABUS:

UNIT-I: FUNDAMENTALS OF ARTIFICIAL NEURAL NETWORKS (09 periods)

Neural networks - introduction, biological neural network. Artificial neural network - advantages, architectures, activation functions, important terminologies of ANN. Mcculloch-pits neuron model. Learning strategies - supervised, unsupervised and reinforced. Hebbian learning rule, Perceptron learning rule, delta learning rule, Widrow-hoff learning rule, correlation learning rule, winner-take-all learning rule, out star learning rule, concept of linear separability.

UNIT-II: FEEDFORWARD AND FEEDBACK NETWORKS (11 periods)

Supervised networks: Back propagation neural network - architecture, training algorithm, learning factors, initial weights, steepness of the activation function, learning constant, momentum method and necessary number of hidden neurons.
Un-supervised networks: Kohonen self-organizing map-competitive process, cooperation process, adaptive process, training algorithm.
Associative memories: Concepts, Bidirectional Associative Memory (BAM) - architecture, discrete BAM-algorithm, analysis of hamming distance, energy function and storage capacity. Discrete Hopfield network - architecture and training algorithm. Electrical load forecasting - Artificial neural networks for short-term electrical load forecasting.

UNIT-III: CLASSICAL AND FUZZY SETS (09 periods)

Introduction to fuzzy logic. Classical sets - operations, properties. Fuzzy sets - operations, properties. Crisp relations - cardinality, operations, properties, cartesian product, composition. Fuzzy relations - cardinality, operations, properties, fuzzy cartesian product, composition. Linguistic hedges, membership functions - features, methods of membership value assignments - intuition, inference, rank ordering, neural networks, inductive reasoning.

UNIT-IV: FUZZY LOGIC SYSTEMS (08 periods)

Defuzzification - Lambda-cuts for fuzzy sets and fuzzy relations. Defuzzification methods - max membership principle, weighted average, centroid, center of sums. Fuzzy rule base - formation of rules, decomposition of rules, aggregation of rules - design procedure.
Speed control of DC motor - need of fuzzy logic, selection of membership functions, design of rule base for speed control.

UNIT-V: GENETIC ALGORITHM (08 periods)

Introduction to evolutionary computing - GA, biological background of GA. Terminologies and operators of GA - search space, individuals, genes, fitness function, population, encoding - binary encoding, breading. Selection - roulette wheel, rank, tournament. Crossover - single point and two point crossovers. Mutation - flipping, interchanging and reversing. Probabilities of cross over and mutation. Replacement - random, weak parent replacement. Termination criteria, flow chart, advantages, limitations and applications. Application of genetic algorithm for optimal allocation of capacitors in distribution system.

Total Periods: 45

TEXT BOOKS:

1. S.N. Sivanandam, S.N. Deepa, *Principles of Soft computing*, Wiley India private Ltd., 2nd edition, 2013.
2. Timothy J Ross, Fuzzy Logic with Engineering Application, Mc Graw Hill Inc., 3rd edition, 2014.

REFERENCES:

1. Jacek M. Zurada, I*ntroduction to Artificial Neural Networks*, Jaico Publishing House.
2. Simon Haykin, *Neural Networks - A Comprehensive Foundation*, Prentice-Hall Inc, 1999.

IV B.Tech. - I Semester

(16BT6HS01) **BANKING AND INSURANCE**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Origin of Banking; Functions of Banking; Role & Functions of RBI; Bank-Customer Relationship; Deposit and Loan Services of Banks; Banking Procedures; Electronic Payment Mechanisms; Business Models; Concepts of Risk and Uncertainty; Fundamentals of Insurance; Principles of Insurance; Essentials of Insurance Contracts; Insurance players in India.

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

CO1. demonstrate Knowledge in
- Tools and concepts of Banking and Insurance.
- Basic Principles and concepts of Insurance and Banking.
- e-fund transfers, e-payments and e-business models.

CO2. develop skills in providing solutions for
- Online banking and e – payments...
- Risk Management through insurance benefits the society at large.
- Money management by leveraging on technology, banking and insurance services.

CO3. exhibit conceptual soundness about banking and insurance, this would contribute to More employment opportunities.

CO4. provide life skills for effective utilization of Banking and Insurance facilities.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO BANKING (09 Periods)

Origin and growth of banking, meaning and functions of banking, importance of banking, Reserve Bank of India; functions, monetary policy, open market operations.

UNIT-II:BANK-CUSTOMER RELATIONSHIP (09 Periods)
Debtor-creditor relationship, anti-money laundering, deposit products or services, payment and collection of cheques. Accounts – Types of accounts, procedure for opening and closing an account. Loans and Advances- principles of lending, types of loans.

UNIT-III:BUSINESS MODELS AND ELECTRONIC PAYMENT SYSTEM (09 Periods)
Features, types of e-payment system, e-cash,NEFT, RTGS, Credit cards, Electronic purses and Debit cards.Business models-B2B, B2C, C2C, and B2G.

UNIT-IV:INTRODUCTION TO RISK AND INSURANCE (09 Periods)
Concept of risk, risk *Vs* uncertainty. Insurance definition, Insurance as risk mitigation mechanism, elements of insurance.

UNIT-V:INSURANCE OVERVIEW (09 periods)
Principles of insurance, insurance types, LIC & GIC insurance contract- nature, elements, functions, IRDA, Insurance Players in India.

Total Periods: 45

TEXT BOOKS:

1. A.V. Ranganadha Chary, R.R. Paul,*Banking and Financial system*, Kalyani Publisher, New Delhi, 2nd edition.
2. P.K.Gupta,*Insurance and Risk Management*, Himalaya Publishing House, New Delhi.

REFERENCE BOOKS:

1. Diwan, Praq and Sunil Sharma, *Electronic Commerce-A Manager's Guide to E-Business*, Vanity Books International, Delhi, 2002.
2. Kalakota Ravi and Whinston Andrew B, *Frontiers of Electronic Commerce*, Pearson Education India, New Delhi, 1996.
3. Schneider, Grey P, *Electronic Commerce, Course Technology*, Cengage Learning, 8th edition, New Delhi, 2008.

IV B.Tech. - I Semester

(16BT6HS02) **BUSINESS COMMUNICATION AND CAREER SKILLS**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Nature and scope of communication; Corporate communication; Writing business documents; Careers and resumes; Interviews.

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

CO1. demonstrate knowledge in
- Corporate Communication
- Main Stages of Writing Messages
- Career Building

CO2. analyze the possibilities and limitations of language in
- Communication Networks
- Crisis Management/Communication

CO3. design and develop the functional skills for professional practice inBusiness Presentations & Speeches

CO4. apply written and oral communicationtechniques in preparing and presenting various documents in technical writing.

CO5. function effectively as an individual and as a member in diverse teams.

CO6. communicate effectively with the engineering community and society in formal and informal situations.

DETAILED SYLLABUS:

UNIT-I: NATURE AND SCOPE OF COMMUNICATION (09 Periods)

Introduction: Functions of Communication – Roles of a Manager – Communication Basics –Communication Networks – Informal Communication – Interpersonal Communication –Communication Barriers.

UNIT-II: CORPORATE COMMUNICATION (09 Periods)

Introduction: What is Corporate Communication? – Corporate Citizenship and Social Responsibility – Corporate Communication Strategy – Crisis Management/Communication – Cross-Cultural Communication.

UNIT-III: WRITING BUSINESS DOCUMENTS (09 Periods)
Introduction: Importance of Written Business Communication, Types of Business Messages – Five Main Stages of Writing Business Messages – Business Letter Writing – Effective Business Correspondence – Common Components of Business Letters – Strategies for Writing the Body of a Letter.

UNIT-IV: CAREERS AND RESUMES (09 Periods)
Introduction – Career Building – Business Presentations and Speeches – Resume Formats – Traditional, Electronic and Video Resumes – Sending Resumes – Follow-up Letters – Online Recruitment Process.

UNIT-V: INTERVIEWS (09 Periods)
Introduction – Fundamental Principles of Interviewing – General Preparation for an Interview – Success in an Interview – Types of Interviewing Questions – Important Non-verbal Aspects – Types of Interviews – Styles of Interviewing.

Total Periods: 45

TEXT BOOK:

1. Meenakshi Raman and Prakash Singh, *Business Communication*, Oxford University Press, New Delhi, 2nd edition, 2012.

REFERENCE BOOKS:

1. Neera Jain and Sharma Mukherji, *Effective Business Communication*, Tata Mc Graw-Hill Education, Pvt. Ltd., New Delhi, 2012.
2. Courtland L.Bovee et al., *Business Communication Today*, Pearson, New Delhi, 2011.
3. Krizan, *Effective Business Communication*, Cengage Learning, New Delhi, 2010.
4. R.K. Madhukar, *Business Communication*, Vikas Publishing House Pvt. Ltd., New Delhi, 2005.

IV B.Tech. – ISemester

(16BT6HS03) **COST ACCOUNTING AND FINANCIAL MANAGEMENT**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Scope, Objectives and Elements ofcost Accounting; Cost Sheet and Tender quotations; Variance Analysis: Material variances, Labor variances; Meaning and Scope, Liquidity, Profitability Ratios: concept of Risk and Return on Investment.

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

CO1. demonstrate Knowledge in
- Elements of Costing.
- Basic concepts of Financial Management.
- Risk and Return
- Significance of Cost Accountancy
- Behavioral Finance

CO2. develop skills in
- Material, Labor, Overheads control.
- Excellence and ability to minimize the cost of the organization

CO3. develop effective Communication in Cost control and Financial Management.

CO4. provide solutions for effective investment decisions.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO COST AND COST ACCOUNTING (09 Periods)

Cost and Cost Accounting, Scope, Objectives, Advantages and disadvantages – Cost Accounting vs. Management Accounting – Elements of Costing – Installation of costing system – Material Control, Labour Control, Overhead Control.

UNIT-II: COST SHEET AND PREPARATION OF COST SHEET (09 Periods)

Analysis of Cost – Preparation of cost sheet, estimate, tender and quotation (Simple problems) – Importance of Costing while pricing the products.

UNIT-III: STANDARD COSTING AND VARIANCE ANALYSIS (09 Periods)

Introduction to Standard Costing & Variances – Variance Analysis: Material variances, Labour variances (Simple Problems).

UNIT-IV: INTRODUCTION TO FINANCIAL MANAGEMENT AND RATIO ANALYSIS (09 Periods)

Financial Management-Meaning and Scope, Liquidity, Profitability, Financial Statement Analysis through ratios (Simple Problems).

UNIT-V: INTRODUCTION TO INVESTMENT AND BEHAVIORAL FINANCE (09 Periods)

Investment-Meaning and Definition- concept of risk and returns-Investment Alternatives- Introduction to Behavioral Finance – Anomalies –Key Concepts –Anchoring – Mental Anchoring-Confirmation and Hindsight Bias-Gambler's Fallacy-Herd Behavior-Over Confidence-Overreaction and Availability Bias-Prospect Theory.

Total Periods: 45

TEXT BOOKS:

1. S.P. Jain and K.L. Narang,*Cost Accounting*, Kalyani Publishers, Ludhiana, 6th edition,2002.
2. James C Van Horne, *Financial Management and Policy*, Prentice-Hall of India/Pearson, 12th edition, 2001.

REFERENCE BOOKS:

1. The Institute of Company Secretaries of India, *Cost and Management Study Material*, New Delhi.
2. I.M. Pandey, *Financial Management*, Vikas Publishing House Pvt. Ltd., 10th edition, 2010.

IV B.Tech. – ISemester

(16BT6HS04) **ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Introduction to Entrepreneur Development; Idea generation and formation of Business Plan; Micro and Small Enterprises; Institutional Finance and Support to Entrepreneur; Woman Entrepreneurship.

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

CO1. demonstrate Knowledge in
- Schemes and institutions encouraging entrepreneurship.
- Basic Principles and concepts of Accountancy.
- Significance of entrepreneurship.

CO2. develop skills in providing solutions for
- Personal excellence through financial and professional freedom.
- Women entrepreneurship serving as contrivance in societal development

CO3. develop critical thinking and evaluation ability.

CO4. widens knowledge and build up attitude towards trouble shooting.

CO5. demonstrate business acumen

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO ENTREPRENEURSHIP DEVELOPMENT (09 Periods)

Concept ofEntrepreneurship – Growth of Entrepreneurship in India - Factors affecting entrepreneurship growth - Characteristics of an Entrepreneur – Functions of Entrepreneur – Need for an Entrepreneur – Entrepreneurial Decision Process – Types of Entrepreneurs – Distinction between an Entrepreneur and a manager.

UNIT-II: IDEA GENERATION AND FORMULATION OF BUSINESS PLANS (09 Periods)

Sources of Ideas – Methods of idea generation – Steps in Setting up of a Small Business Enterprise – Formulation of Business Plan – Contents of Business Plan – Significance – Common Errors in Business Plan Formulation, The role of incubation centers for promoting Entrepreneurship, Start-up – New Guidelines.

UNIT-III: MICRO AND SMALL ENTERPRISES (09 Periods)

Meaning and Definition – Micro and Macro units – Essentials – Features – Characteristics– Scope of Micro and Small Enterprises – Objectives of Micro Enterprises – relationship between Micro and Macro Enterprises- Problems of Micro and Small Enterprises.

UNIT-IV: INSTITUTIONAL FINANCE (09 Periods)

Institutional Finance **–** Need-Scope-Services - Various Institutions offering Institutional support: – Small Industries Development of Bank of India (SIDBI), State Industrial Development Corporations (SIDCs)– Small Industries Development Organisation (SIDO) – Small Industries Service Institutes (SISIs) – District Industries Centres (DICs) – National Institute of Entrepreneurship and Small Business Development (NIESBUD) – Technical Consultancy Organizations (TCOS). Micro Units Development and Refinance Agency Bank (MUDRA).

UNIT-V:WOMEN AND RURAL ENTREPRENEURSHIP (09 Periods)

Concept of Women entrepreneur - Functions of Women entrepreneurs - Growth of women entrepreneurship in India - Challenges of Women entrepreneurs- Programmes supporting women entrepreneurship – Rural Entrepreneurship – Meaning, Need for Rural entrepreneurship, Problems of rural entrepreneurship, Role of NGOs, Role of BharatiyaMahila Bank for encouraging Women Entrepreneurs.

Total Periods: 45

TEXT BOOKS:

1. Dr.S.S.Khanka*, Entrepreneurial Development*, S. Chand and Company Ltd, Revised edition, 2012.
2. MadhurimaLall & ShikhaSahai, *Entrepreneurship*, Excel Books India, 2nd edition 2008.

REFERENCE BOOKS:

1. Nandan, H., *Fundamentals of Entrepreneurship*, PHI Learning Pvt. Ltd., 2013, New Delhi, 3rd edition 2013.
2. Vasanth Desai, *The Dynamics of Entrepreneurial Development and Management*, Himalaya Publishing House, 4th edition, 2009.
3. BholanathDutta, *Entrepreneurship Management* – Text and Cases, Excel Books, 1st edition 2009.

IV B. Tech. – I Semester

(16BT6HS05) **FRENCH LANGUAGE (La Langue Francais)**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PREREQUISITES:—

COURSE DESCRIPTION:

Oral communications; Basic grammar; advancedgrammar;basic writing; Business French (La Francais Commercial)

COURSE OUTCOMES:

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

CO1. demonstrate knowledge in
- Process of communication
- Modes of listening
- Paralinguistic features
- Skimming and Scanning
- Elements of style in writing

CO2. analyze the possibilities and limitations of language, understanding
- Barriers to Communication
- Barriers to Effective Listening
- Barriers to Speaking
- Formal and metaphorical language

CO3. design and develop language skills for professional practice**.**

CO4. apply basic writing skills in writing Emails and understanding wide range of technical terminologies.

CO5. understand French culture and civilization.

CO6. communicate effectively with the native French in day to day situation**.**

DETAILED SYLLABUS:

UNIT-I: ORAL COMMUNICATION (09 Periods)

Introduction - Language as a Tool of Communication, French alphabets, Phonetics and pronunciation, making contacts, giving information, Arranging things, Expression of feelings.

UNIT-II: BASIC GRAMMAR (09 Periods)
Introduction –Articles, -Er ending Verbs, Nouns, Numbers, Gender, Pronouns, Sentence structure – Case study.

UNIT-III: ADVANCED GRAMMAR (09 Periods)
Introduction -Adjectives, Prepositions, Introduction to tenses – Present tense, past tense and future tense, Active and Passive voice.

UNIT-IV: BASIC WRITING (09 Periods)
Introduction -Introduction to written communication, Pre-writing, Creating context for writing and Data collection, fill in forms, Write greeting cards, Invitations and Short personal announcements, Short text to describe photos and pictures.

UNIT-V: BUSINESS FRENCH (La Francais Commercial) (09 Periods)
Introduction - E-mail writing, Letter writing, Learning technical vocabulary and its application.
Case study of influential French companies, Learning computer/ desktop/new age- media vocabulary, Introduction to how to present a topic, Fixing an Appointment

Total Periods: 45

TEXT BOOK:

1. Annie Berther, *Alter Ego*, Hachette Publications, 2012.

REFERENCE BOOKS:

1. RegineMerieux, Yves Loiseau, *Connexions*, Goyall Publishers, 2011.
2. DelphineRipaud,*Saison*, French and Euroean Inc., 2015.

IV B.Tech. - I Semester

(16BT6HS06) **GERMAN LANGUAGE (Deutsch alsFremdsprache)**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Oral communication;Basic grammar; Advanced grammar; Basic writing; Berufsdeutcsch (Business German)

COURSE OUTCOMES:

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

CO1. demonstrate knowledge in
- Process of communication
- Modes of listening
- Paralinguistic features
- Skimming and Scanning
- Elements of style in writing

CO2. analyze the possibilities and limitations of language, understanding
- Barriers to Communication
- Barriers to Effective Listening
- Barriers to Speaking
- Formal and metaphorical language

CO3. design and develop language skills for professional practice**.**

CO4. apply basic writing skills in writing Emails and understanding wide range of technical terminologies.

CO5. understandGerman culture and civilization.

CO6. communicate effectively with the native German in day to day situation**.**

DETAILED SYLLABUS:

UNIT-I: ORAL COMMUNICATION (09 Periods)

Introduction - Language as a Tool of Communication, German alphabets, Phonetics and pronunciation, making contacts, giving information, Arranging things, Expression of feelings.

UNIT-II: BASIC GRAMMAR (09 Periods)
Introduction –Articles, Verbs, Nouns, Numbers, Gender, Pronouns, Sentence structure – Case study.

UNIT-III: ADVANCED GRAMMAR (09 Periods)
Introduction -Adjectives, Prepositions, Introduction to tenses – Present tense, past tense and future tense, Active and Passive voice, Introduction to Case- Akkusativ, Nominativ, Dativ&Genetiv Case.

UNIT-IV: BASIC WRITING (09 Periods)
Introduction -Introduction to written communication, Pre-writing, Creating context for writing and Data collection, fill in forms, Write greeting cards, Invitations and Short personal announcements, Short text to describe photos and pictures.

UNIT-V: BERUFSDEUTCSCH (BUSINESS GERMAN) (09 Periods)
Introduction - E-mail writing, Letter writing, Learning technical vocabulary and its application.
Case studies of influential German companies, Learning computer/desktop/new age- media vocabulary, Introduction to how to present a topic, Fixing an Appointment.

Total Periods: 45

TEXT BOOK:

1. Heuber,*Tangram Aktuelleins*, HeuberVerlag Publications, 2011.

REFERENCE BOOKS:

1. Anta Kursisa, Gerhard Newner, Sara vicenta, *Fir fuer Deutsch 1 und Deutsch 2,* HeuberVerlag Publications, 2005.
2. Herman Funk,*Studio D A1*, Cornelsen GOYAL SAAB Publication, 2011.

IV B.Tech. - I Semester

(16BT6HS07) **INDIAN CONSTITUTION**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Elements, functions and functionaries according to Indian Constitution, understanding forbetter professional practice and good citizenry.

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

CO1. demonstrate knowledge in
- Parliamentary proceedings, laws, legislature, administration and its philosophy
- Federal system and judiciary of India
- Socials problems and public services like central civil services and state civil services
- Indian and international political aspects and dynamics

CO2. develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen

DETAILED SYLLABUS:

UNIT-I: PREAMBLE AND ITS PHILOSOPHY (08 Periods)
Introduction and Evolution of Indian Constitution, preamble and its Philosophy.

UNIT-II: UNION GOVERNMENT (08 Periods)
Powers, Functions and Position of President, Vice-President and Council of Ministers, Composition of parliament, Constitution Amendment Procedure, Financial Legislation in Parliament.

UNIT-III:FEDERAL SYSTEM (14 Periods)
Centre-State relations, Directive Principles of State Policy, Fundamental Rights and Duties, Centre-State Relations, Features of Federal System, Administrative Relationship between Union and States, Powers, Functions and Position of Governors, Function of Chief Ministers, Council of Ministers, Composition and powers of the State Legislature.

UNIT-IV:JUDICIARY AND PUBLIC SERVICES (10 Periods)
The Union Judiciary - Supreme Court and High Court, All India Services, Central Civil Services, State Services, Local Services and Training of Civil Services.

UNIT-V: INTERNATIONAL POLITICS (05 Periods)
Foreign Policy of India, International Institutions like UNO, WTO, SAARC and Environmentalism.

Total Periods: 45

TEXT BOOK:

1. Briji Kishore Sharma, *Introduction to the Constitution of India*, Prentice Hall of India, 2005.

REFERENCE BOOKS:

1. Mahendra Pal Singh, V. N. Shukla's, *Constitution of India*, Eastern Book Company, 2011.
2. Pandey J. N, *Constitutional Law of India* - Central Law Agency, 1998.

IV B.Tech. - I Semester

(16BT6HS08) **INDIAN ECONOMY**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Introduction; Time Value of Money; Elementary Economic Analysis; Value analysis, Value Engineering; Economic Planning.

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

CO1. demonstrate knowledge in
- Micro and Macro Economics.
- Traditional and Modern methods of Capital Budgeting.
- Five year plans and NITI Aayog.

CO2. analyze
- Capital Budgeting.
- Value Analysis and Value Engineering.
- Economic analysis
- Law of supply and demand

CO3. understand the nuances of project management and finance

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION (09 Periods)
Economics- Flow in an Economy, Law of Supply and Demand; Micro and Macro Economics; Relationship between Science, Engineering, Technology, and Economic Development;Concept of Engineering Economics-Types of Efficiency, Definition and Scope of Engineering Economics.

UNIT-II: TIME VALUE OF MONEY (12 Periods)
Concepts and Application; Capital Budgeting-Traditional and Modern Methods; Simple and Compound Interest, Cash Flow Diagram, Principle of Economic Equivalence; Evaluation of Engineering Projects – Present Worth Method, Future Worth Method, Annual Worth Method, Internal Rate of Return Method, Cost-benefit Analysis in Public Projects; Depreciation Policy-Depreciation of Capital Assets, Causes of Depreciation, Straight Line Method and Declining Balance Method.

UNIT-III: ELEMENTARY ECONOMIC ANALYSIS (09 Periods)
Economic Analysis – Meaning, Significance, Simple Economic Analysis; Material Selection for a Product, Substitution of Raw Material; Design Selection for a Product;Material Selection-Process Planning, Process Modification.

UNIT-IV: VALUE ENGINEERING (06 Periods)
Introduction- Value Analysis, Value Engineering,Functions, Aims; Value Analysis vs. Value Engineering; Value Engineering Procedure- Advantages, Application Areas.

UNIT-V: ECONOMICPLANNING (09 Periods)
Introduction- Need For Planningin India,Five year plans(1951-2012), NITI Aayog(from 2014 onwards); Inclusive Growth-Meaning, Significance, Need for inclusive growth in India, Strategy for more inclusive growth, Challenges and Prospects; Employment and Inclusive Growth in India, Role of engineers in sustaining inclusive growth.

Total Periods: 45

TEXT BOOKS:

1. Panneer selvam R, *Engineering Economics*, PHI Learning Private Limited, Delhi, 2nd edition,2013.
2. Jain T.R., V. K.Ohri, O. P. Khanna. *Economics for Engineers*, VK Publication, 1st edition, 2015.

REFERENCE BOOKS:

1. DuttRudar & Sundhram K. P. M., *Indian Economy*, S. Chand, New Delhi, 62nd revised Edition, 2010.
2. Misra, S.K. & V. K. Puri., *Indian Economy: Its Development Experience*, Himalaya Publishing House, Mumbai 32nd edition, 2010.

IV B.Tech. - I Semester

(16BT6HS09) **INDIAN HERITAGE AND CULTURE**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

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

CO1. demonstrate knowledge in
- Human aspirations and values in Vedic culture.
- Cultural aspects of Buddhism and Jainism
- Unification of our country under Mourya's and Gupta's administrations
- Socio Religious aspects of Indian culture
- Reform movements and harmonious relations.

CO2. apply ethical principles and reforms as models for the upliftment of the societal status in the present cultural contexts

DETAILED SYLLABUS:

UNIT-I: BASIC TRAITS OF INDIAN CULTURE (09 Periods)
Meaning and definition and various interpretations of culture.Culture and its features.The Vedic and Upanishadic culture and society.Human aspirations and values in these societies.Chaturvidhapurushardhas, Chaturashrma and Chaturvarna theory.

UNIT-II: HUMANISTIC REFORMS UNDER JAINISM AND BUDDHISM (09 Periods)
Salient features of Jainism - contributions of Jainism to Indian culture. Contributions of Aachaarya and Mahaapragya.Buddhism as a humanistic culture.The four noble truths of Buddhism.Contributions of Buddhism to Indian culture.

UNIT-III: CULTURE IN THE MEDIEVAL PERIOD (09 Periods)
Unifications of India under Mouryas and Guptas and their cultural achievements. Cultural conditions under satavahanas. Contributions to pallavas and cholas to art and cultural achievements of vijayanagara rulers.

UNIT-IV: SOCIO RELIGIOUS REFORMS IN INDIAN CULTURE (09 Periods)
Western impact on India, Introduction of western education, social and cultural awakening and social reform movements of Rajaramohan Roy – DayanandhaSaraswathi- Anne Besant. (theosophical society)

UNIT-V: REFORM MOVEMENTS FOR HARMONIOUS RELATIONS (09 Periods)
Vivekananda, Eswar Chandra vidyasagar and Veeresalingam-emancipation of women and struggle against caste. Rise of Indian nationalism. Mahatma Gandhi- Nonviolence and satyagraha and eradication of untouchability.

Total Periods: *45*

TEXT BOOK:

1. ValluruPrabhakaraiah, *Indian Heritage and Culture*, Neelkamal Publications Pvt. Ltd. Delhi, 1st edition, 2015.

REFERENCE BOOKS:

1. L. P. Sharma, *History of Ancient India*, Konark Publishers, Pvt. Ltd., New Delhi, 2010.
2. L. P. Sharma, *History of Medieval India*, Konark Publishers, Pvt. Ltd., New Delhi, 2010.
3. L. P. Sharma, *History of Modern India*, Konark Publishers, Pvt. Ltd., New Delhi, 2010.
4. The Cultural Heritage of India Vol-I, II, III, IV, V, *The Ramakrishna Mission Institute of Culture*, Calcutta.

IV B.Tech. - I Semester

(16BT6HS10) **INDIAN HISTORY**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

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

CO1. demonstrate knowledge on evolution and history of India as a nation
CO2. analyze social and political situations of past and current periods
CO3. practice in career or at other social institutions morally and ethically

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION (08 Periods)
Elements of Indian History; History Sources: Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; sociological concepts-structure, system, organization, social institutions, Culture and social stratification (caste, class, gender, power), State& Civil Society.

UNIT-II: ANCIENT INDIA (09 Periods)
Mohenjo-Daro civilization; Harappa civilization; Mauryan Empire.

UNIT-III: CLASSICAL AND MEDIEVAL ERA (12 Periods)
Classic Era (200 BC - 1200 AD); Hindu - Islamic Era (1200 - 1800 AD).

UNIT-IV: MODERN INDIA (06 Periods)
Age of Colonialism (17^{th} - 19^{th} centuries); First war of Indian Independence;Freedom Struggle (1857-1947).

UNIT-V: INDIA AFTER INDEPENDENCE (1947 -)

(10 periods)

The Evolution of the Constitution and Main Provisions; Consolidation of India as a Nation; Politics in the States; Indian economy; Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing, Nature of work and organization.

Total Periods: 45

TEXT BOOK:

1. K. Krishna Reddy, *Indian History*, Tata McGraw-Hill, 21st reprint,2017.

REFERENCE BOOKS:

1. Guha, Ramachandra, *India after Gandhi*, Pan Macmillan, 2007.
2. Thapar, Romila, *Early India*, Penguin, 2002.

IV B.Tech. - I Semester

(16BT6HS11) **PERSONALITY DEVELOPMENT**

(Open Elective)

(Common to EEE, ECE &

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: —

COURSE DESCRIPTION:
Self-esteem & Self-Management; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

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

CO1. demonstrate knowledge in
- Self-Management
- Planning Career

CO2. analyze the situations based on
- Attitudes
- Thinking strategies

CO3. design and develop the functional skills for professional practice in

CO4. function effectively as an individual and as a member in diverse teams.

CO5. communicate effectively in public speaking in formal and informal situations.

DETAILED SYLLABUS:

UNIT-I: SELF-ESTEEM AND SELF-IMPROVEMENT (09 Periods)

Know Yourself – Accept Yourself; Self-Improvement: Plan to Improve - Actively Working to Improve Yourself.
Case study: 1

UNIT-II: DEVELOPING POSITIVE ATTITUDES (09 Periods)

How Attitudes Develop – Attitudes are Catching – Improve Your Attitudes.
Case study: 2

UNIT-III: SELF-MOTIVATION AND SELF-MANAGEMENT (09 Periods)

Show Initiative – Be Responsible Self-Management; Efficient Work Habits – Stress Management – Employers Want People Who can Think – Thinking Strategies.

Case study: 3

UNIT-IV: GETTING ALONG WITH THE SUPERVISOR (09 Periods)

Know your Supervisor – Communicating with Your Supervisor – Special Communications With Your Supervisor – What Should You Expect of Your Supervisor? – What Your Supervisor Expects of You - Moving Ahead Getting Along with Your Supervisor.

Case study: 4

UNIT-V: WORKPLACE SUCCESS (09 Periods)

First Day on the Job – Keeping Your Job – Planning Your Career – Moving ahead.

Case study: 5

Total Periods: 45

TEXT BOOK:

1. Harold R. Wallace and L. Ann Masters, *Personality Development*, Cengage Learning, Delhi, 6th Indian Reprint 2011.

REFERENCE BOOKS:

1. Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press, New Delhi, 2011.
2. Stephen R. Covey, *The 7 Habits of Highly Effective People*, Free Press, New York, 1989.
3. K. Alex, *Soft Skills*, S. Chand & Company Ltd, New Delhi, Second Revised Edition 2011.
4. Stephen P. Robbins and Timothy A. Judge*, Organizational Behaviour*, Prentice Hall, Delhi, 16th edition 2014.

IV B.Tech. - I Semester

(16BT6HS12) **PHILOSOPHY OF EDUCATION**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

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

CO1. demonstrate knowledge in
- Philosophy of Engineering education.
- Philosophical Methods.
- Knowledge acquiring methods.
- Engineering education and responsibilities.

CO2. understand the impact of Outcome Based Education for effective educational outcomes

CO3. apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

DETAILED SYLLABUS:

UNIT-I:INTRODUCTION TOPHILOSOPHY AND ENGINNERING EDUCATION (09 Periods)

Concept , Significance, and Scope of Philosophy in Engineering – Aims of Engineering Education – relationship between philosophy and engineering education – speculative, normative and critical approaches of philosophy in engineering.

UNIT-II:PHILOSOPHICAL METHODS AND THEIR IMPLICATIONS INENGINEERING (09 Periods)

Introduction to Philosophical approaches: Idealism, Naturalism, Pragmatism, Realism and Existentialism; Significance and Scope in Engineering Education.

UNIT-III: PHILOSOPHICAL EDUCATION IN INDIA (09 Periods)

Different branches of philosophy- meaning, Epistemology: nature and scope; Knowledge acquiring methods;Kinds and instruments of knowledge; Re-shapingof educational thoughts by Indian thinkers: Rabindranath Tagore, Sri Aurobindo Gosh, Mahatma Gandhi,Jiddu Krishnamurthy and Swamy Vivekananda.

UNIT-IV: VALUES AND ENGINEERING EDUCATION (09 Periods)

Introduction; Engineering educationand responsibilities: health,social, moral, ethics aesthetic;Value: crisis and strategies forinculcation;

Case study: Engineering Solutions given by Mokshagundam Visvesvaraya.

UNIT-V: OUTCOME-BASED EDUCATION (09 Periods)

Institutional visioning;educational objectives; programme outcomes, curriculum,stakeholders, infrastructure and learning resources; governance and management, quality in education.

Total periods: 45

TEXT BOOKS:

1. Ganta Ramesh, *Philosophical Foundations of Education*, Neelkamal Publications, 1st edition,2013.
2. CarlMicham,*Thinking through technology (The Paths between Engineering and Philosophy)*, University of Chicago Press, 1st edition,1994.
3. Louis L Bucciarelli, *Engineering Philosophy,* Delft University Press, 1st edition, 2003.
4. NBA/ABET Manuals.

REFERENCE BOOKS:

1. Louis L Bucciarelli, *Philosophy of Technology and Engineering Sciences*, North Holland, 1st edition, 2009 (e-book).
2. Samuel Florman, *Existential pleasures of education*, Martins's Griffin S.T. publication, 1st edition, 1992.

IV B.Tech. - I Semester

(16BT6HS13) **PUBLIC ADMINISTRATION**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

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

CO1. demonstrate knowledge in
- Public Policy.
- Good Governance.
- E-governance.
- Development Administration.

CO2. analyze the possibilities and limitations ofexisting policies through Good Governance perspective.

CO3. design and develop solutions in e-governance modelsto find and provide opportunities in e-governance.

CO4. adopt principles ofe-governance in addressing the existing issues and challenges in e-governance sector.

CO5. understand the significance of Administrative Development in finding professional engineering solutions by probing
- Bureaucracy.
- Role of civil society.

DETAILEDSYLLABUS:

UNIT-I: INTRODUCTION (09 Periods)
Public and Private Administration- Differences and Similarities, Meaning, Scope; Importance of Public Administration in Modern Era; Public Administration and its implications in the field of Engineering.
Case Study: Unique Identification Authority of India (UIDAI):Aadhaar Project: Challenges Ahead.

UNIT-II: PUBLIC POLICY (09 Periods)
Meaning and Scope; Policy Formulation in India; Policy making process; Policy Implementation.

Engineering and Public Policy**,**Social, ethical, Monetary and fiscal policies; policy implications of engineering;The engineer's role in Public Policy.

Case Study:NITI Aayog: Demonetization and Aftermath of Demonetization – Cashless transactions.

UNIT-III: GOOD GOVERNANCE (09 Periods)

Significance; Objectives;Concepts;Reforms;Organization and its basic problemsAdministrative and Governance reforms in India; Sustainable and Inclusive growth in India;Engineering and Sustainable Environment-Role of Engineers; Right to information Act.

Case Study: Strategies in Good Governance: A Case Study of Karnataka, Kerala and Orissa.

UNIT-IV: E-GOVERNANCE (09 Periods)

Meaning, Significance, Issues in E-governance; E-governance Models, Problems and Opportunities; Application of DataWarehousing and Data Mining in Governance; Engineers role in re-engineering E-governance.

Case Study: e-Housing System for Bhavana Nirman Dhanasahayam Online disbursement of housing assistance in Kerala.

UNIT-V: DEVELOPMENT ADMINISTRATION (09 Periods)

Introduction; Development Administration-Administrative Development- Sustainable Development -Significance-Objectives; Bureaucracy - Personnel administration and human resources development; Role of civil society-Citizens and administration;Development and Engineering: Issues Challenges and Opportunities.

Case Study: Neeru-Chettu (Water-Tree) of Andhra Pradesh.
Case Study: TPDDL of Delhi and Odisha.

Total Periods: 45

TEXT BOOKS:

1. M.P. Sharma, B.L. Sadana, Harpreet Kaur, *Public Administration in Theory and Practice,* Kitab Mahal, Mumbai, 1st edition,2014.
2. CSR Prabhu, *E., Governance – concepts and case studies*, PHI, New Delhi, 2nd edition, 2012.

REFERENCE BOOKS:

1. Surendra Munshi, Bijupaul Abraham, *Good Governance, Democratic societies and Globalization,* Sage publications, New Delhi, 1st edition, 2004.
2. R.K.Sapru, *Public Policy,*Sterling Publishers Pvt. Ltd., New Delhi, 1st edition, 2001.

IV B.Tech. - I Semester

(16BT60112) **BUILDING MAINTENANCE AND REPAIR**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

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

CO1. demonstrate basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.
CO2. analyzefailures, repair and rehabilitation techniques.
CO3. solve complex building maintenance problems through proper investigations and interpretation.
CO4. use modern tools and techniques for various repairs and rehabilitation of structures.
CO5. provide solutions for building maintenance and repair problems considering health and safety.
CO6. consider environmental sustainability in building maintenance and repair.
CO7. maintain ethical standards for quality in repairs and rehabilitation of structures.
CO8. evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

DETAILED SYLLABUS:

UNIT-I: DURABILITY AND SERVICEABILITY OF BUILDINGS (10 Periods)

Life expectancy of different types of buildings; Effect of environmental elements such as heat, dampness, frost and precipitation on buildings; Effect ofchemical agents on building materials, Effect of pollution on buildings, Effect of fire onbuilding; Damage by biological agents like plants, trees, algae, fungus, moss, insects, etc.; Preventive measures on various aspects, Inspection, Assessment procedure for evaluating for damaged structures, Causes of deterioration, Testing techniques.

UNIT-II:FAILURE AND REPAIR OF BUILDINGS (10 Periods)
Building failure – Types, Methodology for investigation; Diagnostictesting methodsandequipment, Repair of cracks inconcrete and masonry, Materials for Repair,Methods of repair, Repair and strengthening of concrete buildings, Foundationrepair and strengthening, Underpinning, Leakage of roofs and repair methods.

UNIT-III: TECHNIQUES FOR REPAIR (08 Periods)
Rust eliminators and polymers coating for rebars during repair, Foamed concrete, Mortar and dry pack, Vacuum concrete, Gunite and shotcrete, Epoxy injection, Mortar repairs for cracks, Shoring and underpinning.

UNIT-IV: MAINTENANCE OF BUILDINGS (09 Periods)
Reliability principles and its applications in selection of systemsfor building, Routine maintenance of building, Maintenance cost, Specifications formaintenance works, Dampness-Damp proof courses, Construction details for prevention ofdampness; Termite proofing, Fire protection, Corrosion protection.

UNIT-V: CONSERVATION AND RECYCLING (08 Periods)
Performance of construction materials and components in service, Rehabilitation of constructed facilities, Conservation movement, Materials and methodsfor conservation work, Recycling of old buildings and its advantages, Examples.

Total Periods: 45

TEXT BOOKS:

1. Dennison Campbell, Allen and Harold Roper, *Concrete Structures – Materials, Maintenance and Repair*, Longman Scientific and Technical, UK, 1991.
2. Allen, R.T. L., Edwards, S.C. and J. D. N. Shaw,*TheRepair of Concrete Structures*, Blackie Academic & Professional, UK, 1993.

REFERENCE BOOKS:

1. Peter H. Emmons, *Concrete Repair and Maintenance*, John Wiley and Sons Publications, 2002.
2. Building Constructionunder Seismic Conditions in the Balkan Region, UNDP/UNIDO Project Rer/79/015,Volume 5, *Repair and Strengthening of Reinforced Concrete, Stone and Brick Masonry Buildings*, United Nations Industrial Development Organisation, Vienna.
3. Shetty, M. S., *Concrete Technology*, S. Chand and Company.
4. Smith, P. and Julian, W., *Building Services*, Applied Science Publications, London, 1976.
5. SP: 25, BIS;*Causes and Prevention of Cracks in Buildings*.
6. Champion, S., *Failure and Repair of Concrete Structures*, John Wiley and Sons Publications, 1961.
7. Perkins, P. H., Repair, Protection and Water Proofing of Concrete Structures, E & FN Spon, UK, 3rd edition, 1997.

IV B.Tech. - I Semester

(16BT60113) **CONTRACT LAWS AND REGULATIONS**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

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

CO1. demonstrate basic Knowledge on construction contracts, tenders, arbitration, legalrequirements and labour regulations.
CO2. analyze contracts and tenders.
CO3. address the legal issues in contracts and tenders.
CO4. follow laws and regulations in the preparation of contracts and tenders.
CO5. prepare contract and tender documents as per the standards.
CO6. consider project schedule, cost, quality and risk in the preparation of contracts and tenders.

DETAILED SYLLABUS:

UNIT-I:CONSTRUCTION CONTRACTS (09 Periods)
Indian contracts act, Elements of contracts, Types of contracts, Features, Suitability, Design of contract documents, International contract document and laws, Standard contract document, Law of torts.

UNIT-II: TENDERS (09 Periods)
Prequalification, Bidding, Accepting; Evaluation of tender from technical, contractual and financial points of view; Two cover system, Preparation of the documentation, Contract formation and interpretation, Potential contractual problems, Price variation clause, Comparison of actions and laws, Subject matter, Violations.

UNIT-III: ARBITRATION (09 Periods)

Arbitration, Comparison of actions and laws, Agreements, Appointment of arbitrators, Conditions of arbitration, Powers and duties of arbitrator, Rules of evidence, Enforcement of award, Arbitration disputes, Dispute review board.

UNIT-IV: LEGAL REQUIREMENTS (09 Periods)

Legal requirements for planning, Property law, Agency law, Tax laws – Income tax, Sales tax, Excise and custom duties, Local government approval, Statutory regulations, Insurance and bonding, Laws governing purchase and sale, Use of urban and rural land, Land revenue codes, EMD, Security deposits, Liquidated damages.

UNIT-V:LABOUR REGULATIONS (09 Periods)

Social security, Welfare legislation; Laws relating to wages, bonus and industrial disputes; Labour administration, Insurance and safety regulations, Workmen's compensation act, Maternity benefit act, Child labour act, Other labour laws.

Total Periods: 45

TEXT BOOKS:

1. Subba Rao,G.C.V., *Law of Contracts I & II*, S. Gogia & Co., 11th edition, 2011.
2. Jimmie Hinze, *Construction Contracts,*McGraw Hill, 3rd edition, 2011.

REFERENCE BOOKS:

1. Kishore Gajaria, *GT Gajaria's Law Relating to Building and Engineering Contracts in India*, Lexis Nexis Butterworths India, 4th edition, 2000.
2. Patil, B. S,*Civil Engineering Contracts and Estimates*, University Press (India) Private Ltd., 4th edition, 2015.
3. Joseph T. Bockrath, *Contracts and the Legal Environment for Engineers and Architects*, McGraw Hill Education, 7th edition, 2010.
4. AkhileshwarPathak, *Contract Law*, Oxford University Press, 2011.

IV B.Tech. - I Semester

(16BT60114) **DISASTER MITIGATION AND MANAGEMENT**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OUTCOMES: On successful completion of course, students will be able to:

CO1. demonstrate knowledge on disasters, their vulnerability and mitigation measures.
CO2. analyze disasters and their vulnerability.
CO3. design strategies for effective disaster mitigation.
CO4. address pre and post disaster issues for better preparedness and mitigation measures, through proper analysis and interpretation.
CO5. use appropriate methods in disaster mitigation and management.
CO6. use historical data of disasters to inform the people over preparedness and mitigation measures.
CO7. solve disaster related issues considering environment.
CO8. consider economical issues in disaster management.

DETAILED SYLLABUS:

UNIT-I: DISASTERS (09 Periods)
Types of disasters - Natural disasters; Impact of disasters on environment, infrastructure and development; Concepts of hazards and vulnerability analysis, Hazard Assessment, Guidelines for hazard assessment and vulnerability analysis, Basic principles and elements of disaster mitigation.

UNIT-II: EARTHQUAKES (09 Periods)
Introduction to earthquake, Intensity scale (MSK–64), Seismic activity in India, Seismic zones of India, Earthquakes in A.P., Action plan for earthquake disaster preparedness, Elements at risk, Recovery and rehabilitation after earthquake, Earthquake resistant design and construction of buildings; Tsunami – Onset, Types and causes,Warning, Elements at risk, Typical effects, Specific preparedness and mitigation strategies.

UNIT-III: FLOODS, CYCLONES AND DROUGHTS
(11 Periods)

Floods and Cyclones: Onset, Types, Warnings; Elements at risk, Typical effects, Indian floods and cyclones, Hazard zones, Potential for reducing hazards, Mitigation strategies and community based mitigation.

Droughts: Onset, Types and warning; Causes, Impact, Early warning and response mechanisms, Mitigation strategies, Droughts in India.

UNIT-IV: LANDSLIDES **(08 Periods)**

Onset, Types and warning; Causes, Elements at risk, Indian landslides, Hazards zones, Typical effects, Mitigation strategies and community based mitigation.

UNIT-V: DISASTER MANAGEMENT **(08 Periods)**

Disaster management organization and methodology, Disaster management cycle, Disaster management in India – Typical cases; Cost–benefit analysis with respect to

various disaster management programs implemented by NGOs and Government of India.

Total Periods: 45

TEXT BOOKS:

1. V. K. Sharma, *Disaster Management, Medtech Publishing,* 2nd edition, 2013.
2. Anand S. Arya, AnupKaranth, and AnkushAgarwal, *Hazards, Disasters and Your Community: A Primer for Parliamentarians*, GOI–UNDP Disaster Risk Management Programme, Government of India, National Disaster Management Division, Ministry of Home Affairs, New Delhi, Version 1.0, 2005.

REFERENCE BOOKS:

1. Donald Hyndman and David Hyndman, *Natural Hazardsand Disasters*, Cengage Learning, 3rd edition, 2011.
2. *Disaster Management in India,* AStatus Report, Ministry of Home Affairs, Govt. of India, May, 2011.
3. Rajendra Kumar Bhandari, *Disaster Education and Management: A Joyride for Students, Teachers, and Disaster Managers*, Springer India, 2014.
4. R. B. Singh, *Natural Hazards and Disaster Management*, Rawat Publications, 2009.

IV B.Tech - I Semester

(16BT60115) **ENVIRONMENTAL POLLUTION AND CONTROL**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Fundamentals ofair pollution;Dispersion of pollutants; Effects and control of air pollution; Water pollution;Soil pollution and control; Municipal solid waste management.

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

CO1. demonstrateknowledge on air, water, soil pollution and their control and solid waste management.
CO2. analyze causes and effects of air, water and soilpollution and their remedial measures.
CO3. recommend suitable solutionsto complex environmental pollution problems.
CO4. use appropriate remedial technique to solve environmental pollution problems.
CO5. understand the effects of environmental pollutionon human health and vegetation.
CO6. encourage sustainable development through implementation of pollution control measures.
CO7. maintain IS Codes for environmental quality control.

DETAILED SYLLABUS:

UNIT-I: AIR AND NOISE POLLUTION (08 Periods)

Air Pollution: Scope, Significance, Classification, Sources – Line, Area, Stationary, Mobile; Effects of air pollutants on man, material and vegetation; Global effects of air pollution; Air pollution meteorology - Lapse rate, Inversion, Plume pattern;Dispersion of air pollutants - Dispersion models and applications; Ambient air quality standards.

Noise Pollution: Sound pressure, Power and intensity,Impacts of noise, permissible limits of noise pollution, measurement of noise.

UNIT-II: AIR AND NOISE POLLUTIONCONTROL (10 Periods)
Self-cleansing properties of the environment,Dilution method, Control at source, Process changes and equipment modifications, Control of particulates–Types of equipment, Design and operation –Settlingchambers,Centrifugal separators, Bag house filters, Wet scrubbers, Electrostatic precipitators; Control of gaseouspollutants – Adsorption, Absorption, Condensation, Combustion; Control of air pollution from automobiles, Control of noise pollution.

UNIT-III: WATER POLLUTIONAND CONTROL (10 Periods)
Water pollution – Sources, Causes, Effects; Surface and groundwater quality – Physical, Chemical, Biological; Drinking water quality standards, Water purification – Processes, Engineered systems – Aeration, Solids separation, Settling operations, Coagulation, Softening, Filtration, Disinfection; Wastewater – Sources, Causes, Effects, Treatment and disposal – Primary, Secondary, Tertiary; Case studies.

UNIT-IV: SOIL POLLUTION AND CONTROL (08 Periods)
Soil pollutants, Sources of soil pollution, Causes, Effectsand control of soil pollution, Diseases caused by soil pollution, Methods to minimize soil pollution, Effective measures to control soil pollution, Case studies.

UNIT-V: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)
Types of solid waste, Composition of solid waste, Collection and transportation of solid waste, Methods of disposal – Opendumping, Sanitary landfill, Composting, Incineration, Utilization - Recovery and recycling, Energy Recovery.

Total Periods: 45

TEXT BOOKS:

1. Peavy, H. S, Rowe, D. R., and Tchobanoglous, G., *Environmental Engineering*, McGraw Hill Inc., 1985.
2. C.S.Rao, *Environmental Pollution Control Engineering*, New Age International Pvt. Ltd., 2nd edition, 2007.
3. Ibrahim A. Mirsa, *Soil Pollution: Origin, Monitoring & Remediation*, Springer, UK, 2nd edition, 2008.

REFERENCE BOOKS:

1. M.N. Rao and H.V.N. Rao, *Air Pollution,* Tata McGraw–Hill Education Pvt. Ltd., 19th edition, 2010.
2. Daniel Vallero, *Fundamentals of Air Pollution,* Academic Press (Elsevier), 5th edition, 2014.
3. S.M.Khopkar,*Environmental Pollution Monitoring and Control,* New Age International Pvt. Ltd., 2nd edition, 2007.
4. V. M. Domkundwar, Environmental Engineering, Dhanpat Rai & Co. Pvt. Ltd., New Delhi, 2014.

IV B.Tech - I Semester

(16BT60116) **PLANNING FOR SUSTAINABLE DEVELOPMENT**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Sustainable development;Environmental impact;Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

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

CO1. demonstrate the knowledge on sustainable development, environmental impact, sustainable policies, governance, systems and strategies, media and education for sustainability.
CO2. analyze theories, environmental impact, policies, systems and strategies for sustainable development.
CO3. develop suitable methods and systems for sustainable development.
CO4. use appropriate techniquesin solving issues related to sustainable development.
CO5. provide solutions to problems associated with sustainable development considering society.
CO6. consider environment while planning sustainable development.
CO7. communicate effectively on sustainable development issues through media and education.
CO8. consider economical issues while planning for sustainable development.

DETAILED SYLLABUS:

UNIT-I: SUSTAINABLE DEVELOPMENT (09 Periods)
Definition and concepts of sustainable development, Capitalization of sustainability - National and global context;Millennium development goals, Emergence and evolution of sustainability and sustainable development, Theories of sustainability, Case studies.

UNIT-II: ENVIRONMENTAL IMPACT (09 Periods)

Climate change – Science, Knowledge and sustainability; Unforeseen environmental impacts on development, Challenges of sustainable development, Centrality of resources in sustainable development, Case studies.

UNIT-III: SUSTAINABLE POLICIES AND GOVERNANCE (09 Periods)

Governance - Democracy and Eco–welfare; Global civil society and world civil politics, Civic environmentalism, Policy responses to sustainable development, Economics of sustainability, Social responsibility in sustainability, National action, ISO 14001: Environmental management system.

UNIT-IV: SUSTAINABLE SYSTEMS AND STRATAGIES (09 Periods)

Need for system innovation, Transition and co–evolution, Theories and methods for sustainable development, Strategies for eco–innovation, Ecological foot print analysis, Socio ecological indicators – Eco labels; Policy programmes for system innovation, Case studies.

UNIT-V: MEDIA AND EDUCATION FOR SUSTAINABILITY (09 Periods)

Role of emerging media, Remarkable design and communication art, Activism and the public interest, Education for sustainability, Participation in decision making, Critical thinking and reflection, Case studies.

Total Periods: 45

TEXT BOOKS:

1. John Blewitt, *Understanding Sustainable Development*, Earth Scan Publications Ltd., 2nd edition, 2008.
2. Jennifer A. Elliot, *An Introduction to Sustainable Development*, Earth Scan Publications Ltd., 4th edition, 2006.

REFERENCE BOOKS:

1. Peter Rogers, Kazi F Jalal and John A Boyd, *An Introduction to Sustainable Development*, Earth Scan Publications Ltd., 2006.
2. Simon Dresner, *The Principles of Sustainability*, Earth Scan Publications Ltd., 2nd edition, 2008.
3. Peter Bartelmus, *Environment Growth and Development: The Concepts and Strategies of Sustainability*, Routledge, 3rd edition, 2003.
4. Gabriel Moser, Enric Pol, Yvonne Bernard, MiriliaBonnes, Jose Antonio Corraliza and Maria Vittoria Giuliani, *People Places and Sustainability*, Hogrefe & Huber Publishers, 2nd edition, 2003.

IV B.Tech. - I Semester

(16BT60117) **PROFESSIONAL ETHICS**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Engineering ethics; Professional ideals and virtues; Engineering as social experimentation; Responsibilities and rights; Global issues.

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

CO1. demonstrate the principles of ethics, importance of professional values and social responsibility.
CO2. analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
CO3. develop suitable strategies to resolve problems arise in practicing professional ethics.
CO4. provide solutions to complex problems associated with professional ethics by proper analysis and interpretation.
CO5. use appropriate theories in resolving issues pertain to professional ethics.
CO6. understand the impact of professional ethics on society and address the limitations of codes of ethics.
CO7. practice engineering with professionalism, accountability and ethics.
CO8. function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
CO9. write reports without bias and give instructions to follow ethics.

DETAILED SYLLABUS:

UNIT-I: ENGINEERING ETHICS (09 Periods)
Scope and aim of engineering ethics, Senses of engineering ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy-Kohlberg's theory, Gilligan's theory, Consensus and controversy.

UNIT-II:PROFESSIONAL IDEALS AND VIRTUES (08 Periods)
Theories about virtues, Professions, Professionalism, Characteristics, Expectations, Professional responsibility, Integrity, Self-respect, Sense of responsibility, Self-interest, Customs and religion, Self-interest and ethical egoism, Customs and ethical relativism, Religion and divine command ethics, Use of ethical theories, Resolving moral dilemmas and moral leadership.

UNIT-III:ENGINEERING AS SOCIAL EXPERIMENTATION (10 Periods)
Engineering as experimentation, Similarities to standard experiments, Learning from the past and knowledge gained, Engineers as responsible experimenters, Conscientiousness, Moral autonomy and accountability, The challenger case, Codes of ethics and limitations, Industrial standards, Problems with the law of engineering.

UNIT-IV: RESPONSIBILITIES AND RIGHTS (09 Periods)
Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Rights of engineers, Professional rights, Whistle-blowing, The BART case, Employee rights and discrimination.

UNIT-V: GLOBAL ISSUES (09 Periods)
Multinational corporations, Professional ethics, Environmental ethics, Computer ethics, Engineers as consultants, Witnesses, Advisors and Leaders, Engineers as Managers, Managerial ethics applied to Engineering Profession, moral leadership.

Total Periods: 45

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw-Hill, 3rd edition, 2007.
2. Govindarajan, M., NataGovindarajan, M., Natarajan, S. and Senthilkumar, V. S., *Engineering Ethics*, Prentice Hall of India, 2004.

REFERENCE BOOKS:

1. S. Kannan and K. Srilakshmi, *Human Values and Professional Ethics*, Taxmann Allied Services Pvt Ltd., 2009.
2. Edmund G. Seebauer and Robert L. Barry, *Fundamental of Ethics for Scientists and Engineers*, Oxford University Press, 2001.
3. Charles F. Fledderman, *Engineering Ethics*, Pearson Education, 2nd edition, 2004.

IV B.Tech. - I Semester

(16BT60118) **RURAL TECHNOLOGY**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Rural technology; Non conventionalenergy; Community development; IT in rural development.

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

CO1. demonstrate the knowledge on technologies for rural development.
CO2. analyze various technologies available which are appropriate for rural development.
CO3. carryout feasibility study on the public and private partnership for rural development.
CO4. develop and use latest technologies for rural development.
CO5. address health and safety issues while choosing technologies for rural development.
CO6. educate the rural populace on the positive impacts of bio-fertilisers and usage of agro machinery in agriculture.

DETAILED SYLLABUS:

UNIT-I:RURAL TECHNOLOGY (09 Periods)
India - Technology and rural development, Pre and post-independence period,Rural India Life, Indian farmer, Role of science and technology in rural development, Rural technology and poverty eradication, Rural business hubs, Technology in improving rural infrastructure,Various organizations related to innovation, Issues of technology transfer - CAPART, NABARD, CSIR, NIF.

UNIT-II: NON CONVENTIONAL ENERGY (09 Periods)
Definition of energy, Types of alternative sources of energy, Sources of non-conventional energy – Solar energy: Solar cooker,Solar heater; Biogas, Recycling and management,Wastes conservation, Assessment and production of biomass products and their utilization.

UNIT-III: TECHNOLOGIES FOR RURAL DEVELOPMENT (09 Periods)

Food and agro based technologies, Tissue culture, Nursery,Building and construction technologies, Cultivation and processing of economic plants, Cottage and social industries.

UNIT-IV: COMMUNITY DEVELOPMENT (09 Periods)

Water conservation, Rain water Harvesting, Drinking water, Environment and Sanitation, Bio fertilizers, Medical and aromatic plants, Employment generating technologies–Apiculture, Pisciculture and Aquaculture.

UNIT-V:IT IN RURAL DEVELOPMENT (09 Periods)

Role of information technology (IT) in rural areas, Impact of IT in rural development, Need and necessity of technology, Corporate social responsibilities, Private sector participation (Activities in different spheres: Employment, Education, Health, Agriculture and service sectors) and SaansadAdarsh Gram Yojana (SAGY), Village adoptionschemes.

Total Periods: 45

TEXT BOOKS:

1. M.S.Virdi, *Sustainable Rural Technologies*, Daya Publishing House, 2009.
2. S.V. Prabhathand, P. Ch. Sita Devi, *Technology and Rural India*, Serials Publications, 2012.

REFERENCE BOOKS:

1. R. Chakravarthy and P.R.S. Murthy, *Information Technology and Rural Development,* Pacific Book International, 2012.
2. Shivakanth Singh, *Rural Development Policies and Programmes,* Northern Book Centre, 2002.
3. L.M.Prasad, *Principles and Practice of Management*, S. Chand & Sons, 8th edition, 2014.
4. Venkata Reddy, K., *Agriculture and Rural Development - Gandhian Perspective*,Himalaya Publishing House, 2001.

IV B.Tech - I Semester

(16BT60308) **GLOBAL STRATEGY AND TECHNOLOGY**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

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

CO1. demonstrate the knowledge on Strategic management, Research & development strategies, Technology management and transfer, Globalization and Corporate governance.
CO2. identify and analyze crucial problems in strategic management to improve performance of the organizations.
CO3. develop the products and production process by using research and development strategies.
CO4. conduct investigations on the impact of globalization in current scenario in the context of corporate governance.
CO5. appraise the resources and capabilities of the firm in terms of their ability to confer sustainable development.
CO6. apply ethics in strategic decision making.

DETAILED SYLLABUS:

UNIT-I: STRATEGIC MANAGEMENT (09 Periods)
Introduction, Classes of decisions, Levels of strategy, Core competence, Strategic intent and stretch, Approaches to strategy making, Roles of different strategists, Strategic management- Process, Benefits, Limitations; Ethics in strategic decision making, Principles of good strategy, Strategic Management in India.

UNIT-II: RESEARCH & DEVELOPMENT STRATEGIES (09 Periods)

Concept, Evolution of R&D Management, R&D as a business, R&D as competitive advantage, Elements of R & D strategies, Integration of R & D, Selection and implementation of R & D strategies, R & D trends.

UNIT-III: TECHNOLOGY MANAGEMENT AND TRANSFER (09 Periods)

Technology Management: Introduction, Technology - Definition, Components, Classification Features; Technology Management- Concept, Nature; Drivers of Management of Technology-Significance, Scope, Responding to technology challenges.

Technology Transfer: Introduction, Definition, Classification, Significance, Elements of process, Types of Technology Transfer, Package, Modes of Transfer, Routes, Channels and Effectiveness of Technology Transfer.

UNIT-IV: GLOBALISATION (09 Periods)

Definition, Stages, Essential conditions for globalization, Globalization strategies, Competitive advantage of Nations, Factors affecting Globalization, Globalization of Indian business.

UNIT-V: CORPORATE GOVERNANCE: THE INDIAN SCENARIO (09 Periods)

Emergence of corporate governance in India- Landmarks, Models, Codes and status in India, Role and Responsibilities of Regulators, The Board of Directors; Corporate Governance-Specific issues in India, Family owned Business, Corporate Governance and the Indian ethos.

Total periods: 45

TEXT BOOKS:

1. Francis Cherunilam, *Strategic Management*, Himalaya Publishing House, 3rd edition, 2002.
2. C.S.G.Krishnamacharyulu and Lalitha Ramakrishnan, *Management of Technology*, Himalaya Publishing House, 2nd edition, 2012.

REFERENCE BOOKS:

1. White and Bruton, *The Management of Technology and Innovation: A Strategic Approach*, Cengage Learning, 1st edition, 2007.
2. S.K.Mandak, *Ethics in Business and Corporate Governance*, TMH, 2nd edition, 2012.

IV B.Tech - I Semester

(16BT60309) **INTELLECTUAL PROPERTY RIGHTS AND MANAGEMENT**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:

Protection of ideas; innovation and artistic endeavors; Acts and procedure related to patents, trademarks, copy right, design registration, trade secrets and cyber laws; Infringement; Commercialization of intellectual property rights; Case studies in each.

COURSE OUTCOMES:

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

CO1. demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.

CO2. analyse the commercial significance of discoveries and developments and to assist in bringing these into public use.

CO3. investigate and ensure smooth transition from concept to final product by following National & International Laws of Intellectual Property.

CO4. utilize the various policies and procedures related to patents, trademarks and copyrights relating to IPR.

CO5. safeguard, review and manage the intellectual property so that it may receive adequate and appropriate legal protection against unauthorized use.

CO6. follow ethical standards in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of intellectual property and knowledge.

CO7. prepare documents and fill applications needed for filing a patent, design, copyright and trade mark.

DETAILED SYLLABUS:

UNIT-I: OVERVIEW OF INTELLECTUALPROPERTY RIGHTS (09 Periods)

Introduction, Intellectual Property vs. Conventional Property, and importance of intellectual property rights (IPRs), types of intellectual property, International Treaties for protection of IPR-Paris Convention, World Intellectual Property Organization (WIPO), World Trade Organization (WTO), Trade Related Aspects of Intellectual Property Rights (TRIP) Agreement, General Agreement on Tariffs and Trade(GATT).

UNIT-II: TRADEMARKS (09 Periods)

Introduction, Functions and kinds of trademarks, Trade Mark Registration Process, Post registration procedures, Trade Mark maintenance, Transfer of rights, Inter parties Proceedings, Infringement and Dilution of Ownership of Trade Mark, Trade Mark claims, International Trade Mark Law.

UNIT-III: PATENTS (09 Periods)

Introduction, Rights under Patent Law, Patent Application Process, Terms and Maintenance of Patents Requirements, Patent Ownership and Transfer, Licensing of Patent Rights, Sole and Joint Inventors, Disputes over Inventorship, Patent Infringement, International Patent Law, Patent Cooperation Treaty (PCT), Patent Law Treaty (PLT), Substantive Patent Law Treaty (SPLT).

UNIT-IV: COPY RIGHTS, TRADE SECRETS, CYBER LAWS (09 Periods)

Copy Rights: Introduction, nature and scope, subject matter, Rights afforded by copyright law, Copyrights ownership, transfers and duration, Copyright registration process.

Trade Secrets: Introduction, Determination of Trade Secret Status, Employer-Employee Relationships, Protection of submissions.

Cyber laws: E-commerce and cyber laws, cybercrime and legislation- need, objective and scope; IT Act 2000, Information Technology and Information Security.

UNIT-V: INDUSTRIAL DESIGN AND COMMERCIALIZATION OF INTELLECTUAL PROPERTY RIGHTS (09 Periods)

Industrial Design: Introduction, Indian Law related to registration of Industrial Designs, Essential requirements for registration of a design in India, International Agreements – Hague System; Conflicts related to registration of design.

Commercialization of Intellectual Property Rights: Competition and Confidentiality Issues, Antitrust Laws, Assignment of Intellectual Property Rights, Technology, Transfer Agreements, Intellectual Property Issues in the Sale of Business, Legal Auditing of Intellectual Property, Due Diligence of Intellectual Property Rights in a Corporate Transaction.

Total Periods: 45

TEXT BOOKS:

1. Deborah E. Bouchoux, *Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets*, Cengage Learning, 4th edition, 2016.
2. KompalBansal and ParikshitBansal, *Fundamentals of Intellectual Property for Engineers*, BS Publications, 1st edition, 2013.

REFERENCE BOOKS:

1. PrabuddhaGanguli, *Intellectual Property Rights-Unleashing the Knowledge Economy*, McGraw Hill Education, 6th reprint, 2015.
2. P. Narayanan, *Intellectual Property Law*, Eastern Book Company, 3rd edition, 2013.
3. R.Radha Krishnan, S. Balasubramanian, *Intellectual Property Rights: Text and Cases*, Excel Books, 1st edition, 2008.

IV B.Tech. - I Semester

(16BT60310) **MANAGING INNOVATION AND ENTREPRENEURSHIP**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:
Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

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

CO1. demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.
CO2. analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.
CO3. develop a comprehensive and well planned business structure for a new venture.
CO4. conduct investigation on complex problems, towards the development of Project.
CO5. apply modern statistical and mathematical tools to design projects and subsequent work procedures.
CO6. apply ethics in constructive innovation framework.
CO7. exhibit professionalism by employing modern project management and financial tools.

DETAILED SYLLABUS:

UNIT-I: CREATIVITY AND INNOVATION (07 Periods)
Introduction, Levels of innovation, Purposeful innovation and the sources of innovative opportunity, The innovation process, Innovative strategies, Strategies that aim at introducing and innovation, Dynamics of ideation and creativity – Inbound, Outbound; Context and process of new product development, Theories of outsourcing.

UNIT-II: PARADIGMS OF INNOVATION (11Periods)

Systems approach to innovation, Innovation in the context of developed economies and Emerging economies, Examining reverse innovation and its application, Performance gap, Infrastructure gap, Sustainability gap, Regulatory gap, Preference gap, organizational factors effecting innovation at firm level.

UNIT-III: SOURCES OF FINANCE AND VENTURE CAPITAL (07 Periods)

Importance of finance, Comparison of venture capital with conventional development capital, Strategies of venture funding, Investment phases, Investment process, Advantages and disadvantages of venture capital, Venture capital developments in India.

UNIT-IV: INTELLECTUAL PROPERTY INNOVATION AND ENTREPRENEURSHIP (11 Periods)

Introduction to Entrepreneurship, Evolution of entrepreneurship from economic theory, Managerial and entrepreneurial competencies, Entrepreneurial growth and development, Concepts, Ethics and Nature of International Entrepreneurship, Intellectual property – forms of IP, Patents, Trademarks, Design registration, Copy rights, Geographical indications, Patent process in India.

UNIT-V: OPEN INNOVATION FRAMEWORK AND PROBLEM SOLVING (09 Periods)

Concept of open innovation approach, Difference between open innovations and Cloud innovation approaches, Limitations and Opportunities of open innovation framework, Global context of strategic alliance, Role of strategic alliance, Problem Identification and Problem Solving, Innovation and Diversification.

Total Periods: 45

TEXT BOOKS:

1. Vinnie Jauhari, SudhanshuBhushan, *Innovation Management*, Oxford University Press, 1st edition, 2014.
2. Drucker, P. F., *Innovation and Entrepreneurship*, Taylor & Francis, 2nd edition, 2007.

REFERENCE BOOKS:

1. Robert D Hisrich, Claudine Kearney, *Managing Innovation and Entrepreneurship,* Sage Publications, 1st edition, 2014.
2. V.K.Narayanan, *Managing Technology and Innovation for Competitive Advantage*, Pearson India, 1st edition, 2002.

IV B.Tech. - I Semester

(16BT60311) **MATERIALS SCIENCE**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:
Structure and Bonding in metals; Steels, Cast Irons and Non Ferrous alloys; Material Selection for conductors, Insulators and semiconductors; Strengthening mechanisms of metals; Plastics and Ceramics as Insulators; AC and DC properties of Insulators; Semiconductors and Magnetic materials; Composite materials in Electrical and Electronics engineering; Material Selection and manufacturing of Optical fibers.

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

CO1. demonstrate the knowledge on concepts of fundamental science and engineering principles relevant to materials.
CO2. analyze the structures of various types of Ferrous, Non-ferrous alloys influencing various engineering applications.
CO3. conduct investigations to select suitable materials with desired properties for engineering applications.
CO4. use phase diagrams to interpret the data regarding microstructure of materials.
CO5. consider health and safety issues while providing materials to real time applications.
CO6. use composite materials that reduce material waste in design and manufacturing for sustainability.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO MATERIAL SCIENCE **(07 Periods)**

Structure of metals: Bonds in Solids, Crystallization of metals, Grain and grain boundaries, Effect of grain boundaries on the properties of metals / alloys, Determination of grain size measurement.

Constitution of alloys: Necessity of alloying, Types of solid solutions, Hume rothery rules, Intermediate alloy phases.

UNIT-II: CAST IRONS, STEELS AND NON-FERROUS METALS (12 Periods)

Structure and properties of Grey cast iron, Spheroidal cast iron, White Cast iron, Malleable Cast iron, Alloy cast irons, Classification of steels, structure and properties of plain carbon steels, Structure and properties of Copper and its alloys, Aluminum and its alloys.

UNIT-III: ELECTRIC CONDUCTORS AND INSULATORS (12 Periods)

Type of materials selected for conductors, Insulators and semiconductors, Introduction to ceramics - Bonding and microstructure, DC properties of ceramic materials, AC properties of ceramic materials, mechanical properties, Ceramics as Conductors, Insulators and capacitors; Introduction to Plastics - DC properties, AC properties, Mechanical properties.

UNIT-IV: SEMICONDUCTORS AND MAGNETIC MATERIALS (09 Periods)

Fabrication of Semiconductors, Producing a silicon wafer-Lithography and Deposition packaging of semiconductors materials; Types of magnetic materials, Measuring magnetic properties, Application of soft magnetic materials in Electromagnets and relays, AC transformers, Generators and motors.

UNIT-V: ADVANCED MATERIALS AND APPLICATIONS (05 Periods)

Composites - Fiber reinforced metal matrix, Ceramic matrix, Polymer matrix, Properties and applications of composites; Ceramics - Alumina, Zirconia, Silicon Carbide, SiAlONs, Reaction Bonded Silicon Nitride (RBSN); Glasses- properties and applications, manufacturing of optical fibers.

Total Periods: 45

TEXT BOOKS:

1. Kodgire V D, *Material Science and Metallurgy*, Everest Publishing House, Pune, 31st edition, 2011.
2. Ian. P.Jones, *Material Science for Electrical and Electronic Engineers*, Oxford University Press, 1st edition, 2000.

REFERENCE BOOKS:

1. V. Raghavan, *Physical Metallurgy: Principles and Practices*, PHI, New Delhi, 2nd edition, 2006.
2. William. D. Callister, *Materials Science & Engineering-An Introduction*, John Wiley and Sons, New Delhi, 6th edition, 2002.

IV B.Tech. - I Semester

(16BT70412) **GREEN TECHNOLOGIES**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

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

CO1. deploy conceptual knowledge in green technologies pertaining toengineering practice.
CO2. analyze various green technologies for engineering practice.
CO3. provide green solutions to engineering problems.
CO4. apply various green techniques in the engineering practice.
CO5. consider health and safety issues while providing green solutions to the society.
CO6. understand issues related to environment sustainability.
CO7. apply ethical standards for environmental sustainability in the engineering practice.

DETAILED SYLLABUS:

UNIT-I: PRINCIPLES OF GREEN ENGINEERING AND GREEN COMMUNICATIONS (11 Periods)

Principles of Green Engineering:
Introduction, Definition of green engineering, Principles of green engineering.

Green Communications:
Introduction, Origin of Green Communications, Energy Efficiency in Telecommunication systems, Telecommunication system model and energy Efficiency, Energy saving concepts, Quantifying energy efficiency in ICT, Energy efficiency metrics of green wireless networks, Embodied energy of communication devices- Introduction, The extended energy model, Embodied/Operating Energy of a BS in Cellular network- A Case study; Energy efficient standards for wireline communications.

UNIT-II: GREEN ENERGY (09 Periods)

Introduction, adverse impacts of carbon emission, control of carbon emission– methods, greenhouse gas reduction – methods, Energy sources and their availability, Green energy for sustainable development. Green energy sources – Solar energy, Wind energy, Fuel cells, Biofuels, Wave and Geothermal energy (Principle of generation only).

UNIT-III: GREEN IT (09 Periods)

The importance of Green Information technologies, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social Media, Regulating Green IT- Laws, Standards and Protocols; RoHS, REACh, WEEE, Legislating for GHG Emissions and Energy Use of IT Equipment, Non-regulatory Government Initiatives, Industry Associations and Standard Bodies, Green Building Standards, Green Data Centres, Social Movements and Greenpeace, Conclusions.

UNIT-IV: GREEN CONSTRUCTION (09 Periods)

Green Building: Definition, Typical features, Benefits, Requisites for green building construction, Sustainability, Concept of REDUCE, REUSE, RECYCLE, RETHINK, REPLENISH AND REFUSE (6 R's), Sustainable construction focus point – Site selection, Planning, Water, Energy, Material, Indoor air quality, Construction procedures.

Indian Green Building Council: Introduction to IGBC green homes, Benefits of IGBC, IGBC green home rating system, Introduction to USGBC, LEED rating system, Procedure to get IGBC certification, GRIHA Rating.

UNIT-V: GREEN MANUFACTURING (09 Periods)

Introduction, background, definition, motivation and barriers to green manufacturing, Impact of manufacturing in environmental ecology, Need for green manufacturing, Advantages and Limitations, green manufacturing strategies, Green manufacturing and sustainability, Sustainability tools; Waste stream mapping and application, Green manufacturing through clean energy supply, green lean manufacturing, green packaging and supply chain.

Total Periods: 47

TEXT BOOKS:

1. Konstantinos Samdanis, Peter Rost, Andreas Maeder, MichelaMeo, Christos Verikoukis, *Green Communications: Principles, Concepts and Practice,* John Wiley & Sons, 2015.
2. Soli J. Arceivala, *Green Technologies for a better future,* McGraw Hill Education (India) Pvt. Ltd, 2014.
3. San Murugesan, G.R. Gangadharan, *Harnessing Green IT – Principles and Practices,* John Wiley & Sons Ltd., 2008.
4. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, *Green Building Handbook*, *Volume 1*, E & FN Spon, an imprint of Thomson Science & Professional.
5. *IGBC Green Homes Rating System Version 1.0* – A bridged reference guide.
6. J Paulo Davim, Green Manufacturing: Processes and Systems, Springer, 2012.
7. David A Dornfeld, Green Manufacturing: Fundamentals and Applications, Springer, 2013.

REFERENCE BOOKS:

1. Athanasios V Alavanidis, ThomaisVlachogianni, *Green Chemistry and Green Engineering*, SynchronaThemata, 2012.
2. G.D. Rai, *Non-conventional Energy Sources*, Khanna Publishers, Delhi, 5th edition,2011.
3. Marty Poniatowski, *Foundation of Green Information Technology, Prentice Hall, 2009.*
4. R. K. Gautham, *Green Homes*, BS publications, 2009.

IV B.Tech. - I Semester

(16BT70413) **INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:

Introduction to the concept ofnano;Description of nanomaterial;Nanostructure characterization tools;Classification of nanomaterials;Fabrication of nanomaterial;Different applications of nanostructures and nanomaterials.

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

CO1. demonstrate knowledge in
- Nanoscale technology.
- Difference between micro and nanotechnology
- Classification of Nanostructure and Nanomaterial
- Fabrication of various nanomaterials and nanostructures.

CO2. analyze numerical and analytical problems in
- Nanomaterial size by using Scanning Electrons
- Microscope and X-Ray diffraction

CO3. design and fabricate devices based on nanostructures like
- Nano solar cell
- Nano cantilever
- Nano bio-sensor

CO4. synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.

CO5. select appropriate technique for fabrication of nanostructures and Nano composites.

CO6. apply ethical standards and legal issues while using chemical substances infabrication of new nanostructures.

DETAILED SYLLABUS:

UNIT-I: FUNDAMENTALS OF NANOTECHNOLOGY (08 Periods)

Introduction – Scientific revolutions, Time and length scale in structures, Definition of a nanosystem; Dimensionality and size dependent phenomena - Surface to volume ratio Fraction of surface atoms, Surface energy and surface stress, surface defects, Properties at nanoscale (optical, mechanical, electronic, and magnetic).

UNIT-II:IDENTIFICATION AND CHARACTERIZATION TOOLS FOR NANOMATERIALS AND NANOSTRUCTURE (10 Periods)

Field Emission Scanning Electron Microscopy (FESEM), Environmental Scanning ElectronMicroscopy (ESEM) High Resolution, Transmission Electron Microscope (HRTEM), Scanning Tunneling Microscope(STM), Surface enhanced Raman spectroscopy (SERS), Secondary Ion Mass Spectroscopy, Focused Ion Beam Photoelectron Spectroscopy, X-ray Photoelectron Spectroscopy (XPS), Auger electron spectroscopy (AES), Rutherford backscattering spectroscopy (RBS), X-Ray Diffraction, Intensities in X-Ray Scattering Particle Size Effect.

UNIT-III:CLASSIFICATION OF NANOMATERIALS(10 Periods)

Classification based on dimensionality, Quantum Dots,Wells and Wires-III-V Nanoparticles, Electronic Structure of Nanosemiconductor, Carbon based nanomaterials (buckyballs, nanotubes, graphene), Metal based nano materials (nanogold, nanosilver and metal oxides), Nanocomposites, Nanopolymers, Nanoglasses, Nano ceramics, Biological nanomaterials, Fulrene-discovery and early years,.

UNIT-IV: SOME FABRICATION TECHNIQUES OF NANOMATERIALS AND NANOSTRUCTURES (09 Periods)

Chemical Methods: Metal Nanocrystals by Reduction, Solvothermal Synthesis, Photochemical Synthesis,Sonochemical Routes, Chemical Vapor Deposition (CVD), Metal Oxide Chemical Vapor Deposition (MOCVD), Plasma Enhanced Chemical Vapour Deposition Technique(PECVD), Hydrothermal Method, Sol-Gel.
PhysicalMethods: Ball Milling, Electrodeposition, Spray Pyrolysis, Flame Pyrolysis, DC/RF Magnetron Sputtering, Molecular Beam Epitaxy (MBE) Thermal Evaporation Method.

UNIT-V:APPLICATIONS (08 Periods)

Solar energy harvesting, Catalysis,Molecular electronics and printed electronics Nanoelectronics, Polymers with aspecial

architecture, Liquid crystalline systems, Linear and nonlinear optical and electro-optical properties, Applications in displays and other devices, Nanomaterials for data storage, Photonics, Plasmonics, Chemical and biosensors, Nanomedicine and Nanobiotechnology, MESFET.

Total Periods: 45

TEXT BOOKS:

1. Pradeep T., *A Textbook of Nanoscience and Nanotechnology*, Tata McGraw Hill Education Pvt. Ltd., 2012.
2. Hari Singh Nalwa, *Nanostructured Materials and Nanotechnology*, Academic Press, 2002.

REFERENCE BOOKS:

1. Nabok A., *Organic and Inorganic Nanostructures*, Artech House, 2005.
2. Dupas C., Houdy P., Lahmani M*, Nanoscience: Nanotechnologies and Nanophysics*, Springer - Verlag Berlin Heidelberg, 2007.
3. S.M. Sze, Physics of Semiconductor Devices, 2nd edition, 2001.

IV B.Tech. - I Semester

(16BT60505) ENGINEERING SYSTEM ANALYSIS AND DESIGN

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:
Systems Process; Technologies for Systems; System Development Life Cycle; System Analysis and Modeling; Levels of Management; Project Management; Systems Implementation and Importance of UML Prototyping; Maintaining and Managing the Systems Output Process.

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

CO1. demonstrate knowledge in
- Systems Process and System Design
- Systems Analysis and Modeling
- System Development Life Cycle
- Design Management and Maintenance Tools.

CO2. analyze system Process and estimate the given models by using case tools.

CO3. design and develop a model to the organizational systems.

CO4. solve complex problems related to engineering systems and produce accurate results

CO5. apply object oriented techniques for modeling dynamic systems.

CO6. contribute towards societal issues and responsibilities in designing, modeling and developing of organizational systems.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION (09 Periods)
Systems, Types of systems, Integrating technologies for systems, Need for system analysis and design, Role of the systems analyst, System development life cycle, CASE tools for analysis and design.

UNIT-II: ANALYSIS AND MODELING ORGANIZATIONAL SYSTEM (09 Periods)

Organization as system, System analysis, Depicting systems graphically, Use case modeling, Levels of management, Organizational culture.

UNIT-III: PROJECT MANAGEMENT (10 periods)

Project initiation, Problem in organization, Determining feasibilities, Ascertaining hardware and software needs, Identifying, Forecasting, Comparing costs and benefits, Activity planning and control, Managing the project.

UNIT-IV: OBJECT ORIENTED ANALYSIS AND DESIGN USING UML (08 Periods)

Introduction, Object modeling, Dynamic modeling, functional modeling, packages and other UML artifacts, the importance of using UML for modeling.

UNIT-V: DESIGNING EFFECTIVE OUTPUT (09 Periods)

Output design objectives, Relating output content to output method, Realizing how output bias affects users, Designing output for display, Case studies-Designing a web site management, Online exam management, Online portal design.

Total Periods:45

TEXT BOOK:

1. Kenneth E. Kendall and Julie E. Kendall,*System Analysis and Design*, Pearson Education, 9th edition, 2011.

REFERENCE BOOKS:

1. Dennis, Wixom and Roth,*Systems Analysis and Design*, John Wiley, 5th edition, 2012.
2. Shelly and Rosenblatt, *Systems Analysis and Design*, Cengage Learning, 9th edition, 2012.

IV B.Tech.- I Semester

(16BT71011) **MICRO-ELECTRO-MECHANICAL SYSTEMS**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:
Overview of Micro Electro Mechanical Systems (MEMS); scaling laws; working principles of microsensors and microactuators; materials; microfabrication processes; packaging of Microsystems.

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

CO1. demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators
CO2. analyze the properties of materials and identify its suitability for MEMS devices.
CO3. design MEMS devices that meet desired specifications and requirements.
CO4. analyze and synthesize the information to provide effective solution to engineering problems with MEMS devices.
CO5. use modern techniques in micro manufacturing process.
CO6. develop efficient and cost effective MEMS based products for society.

DETAILED SYLLABUS:

UNIT-I: OVERVIEW OF MEMS AND SCALING LAWS **(09 periods)**

MEMS and Microsystems, Microsystems and microelectronics, miniaturization, applications of MEMS in the automotive industry and in other industries.

Scaling laws of miniaturization: Introduction to scaling, scaling in: geometry, rigid- body dynamics, electrostatic forces, electromagnetic forces, Electricity, Fluid mechanics, Heat transfer.

UNIT-II: **WORKING PRINCIPLES OF MICROSYSTEMS (09 periods)**

Microsensors,acoustic wave sensors, biomedical and biosensors, chemical sensors, pressure sensors, thermal sensors. Microactuation: actuation using thermal forces, shape-memory alloys, piezoelectric crystals, electrostatic forces. MEMS with microactuators, microgrippers, micromotors, microvalves, micropumps.Microaccelerometers, microfludics.

UNIT-III:MATERIALS FOR MEMS AND MICROSYSTEMS (09 periods)

Substrate and wafers, silicon as a substrate material, silicon compounds, silicon piezoresistors, gallium arsenide, quartz, piezoelectric crystals, polymers, carbon nano tube (CNT), development of CNTs, application of CNTs.

UNIT-IV: MEMS FABRICATION PROCESS AND MICROMANUFACTURING (09 periods)

Photolithography, ion implantation, diffusion, oxidation, chemical vapor deposition, physical vapor deposition, deposition by epitaxy, etching, bulk micromanufacturing, surface micromanufacturing, LIGA process.

UNIT-V: MEMS PACKAGING (09 periods)

Introduction to microsystem packaging, objectives and general considerations in packaging design, three levels of microsystem packaging, interfaces in microsystem packaging, packaging technologies, three-dimensional packaging, selection of packaging materials, signal mapping and transduction, Design case: Pressure sensor packaging.

Total Periods: 45

TEXT BOOK:

1. Tai-Ran Hsu, *MEMS & Microsystems, Design and Manufacture*, McGraw Hill Education (India) Pvt. Ltd., 2002.

REFERENCES BOOKS:

1. G.K.Ananthasuresh, K.J.Vinoy,*Micro and Smart Systems*, Wiley India, 2010.
2. Nitaigour Premchand Mahalik, *MEMS*, McGraw Hill Education (India) Pvt. Ltd., 2007.

IV B.Tech. – I Semester

(16BT61205) **CYBER SECURITY AND LAWS**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:—

COURSE DESCRIPTION:
Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing ad Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber Security; Organizational Implications on Cyber Security; IPR Issues; Cyber Crime and Terrorism; Cyber Crime Illustrations

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

CO1. demonstrate knowledge in Cyber security, Cybercrimes and its related laws in Indian and Global Act.
CO2. analyze the legal perspectives and laws related to cybercrimes in Indian context.
CO3. apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cybercrimes.
CO4. solve Cyber security issues using privacy policies.
CO5. use antivirus tools to minimize the impact of cyber threats.
CO6. follow security standards for the implementation of Cyber Security and laws.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO CYBER CRIMES AND OFFENSES (09 Periods)

Cyber Crimes: Introduction, Definition, Origin, Cybercrime and information security, Cyber criminals, Classifications of cybercrimes, The legal perspectives and Indian perspective, Cybercrime and Indian ITA 2000, Global perspective on cybercrimes.

Cyber Offenses: Introduction, Criminals planning on attacks, Social engineering, Cyber stalking, Cyber cafe and crimes, Botnets.

UNIT-II: TOOLS AND METHODS USED IN CYBER CRIME AND PHISHING AND IDENTITY THEFT (09 Periods)

Introduction, Proxy servers and Anonymizers, Phishing, Password cracking, Key loggers and Spywares, Virus, Worms and Ransomware, Trojan horses and Backdoors, Steganography, DoS and DDoS attacks.

Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

UNIT-III: CYBER CRIMES AND CYBER SECURITY-LEGAL PERSPECTIVES (08 Periods)

Introduction, Cyber laws in Indian context, The Indian IT act, Challenges to Indian law and Cybercrime scenario in India, Consequences of not addressing the weakness in IT act, Digital signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber law, Technology and Students in India scenario.

UNIT-IV: CYBER SECURITY-ORGANIZATIONAL IMPLICATIONS (10 Periods)

Introduction, Web threats for organizations – evils and perils, Security and privacy implications from cloud computing, Social Media Marketing-Security risks and Perils for organizations, Social computing and associated challenges for organizations, Protecting people's privacy in organization, Organizational guidelines for internet usage, Safe computing and Usage policy, Incident handling and Best practices.

UNIT-V: CYBER CRIME AND TERRORISMAND ILLUSTRATIONS (09 Periods)

Cyber Crime & Terrorism: Introduction, Intellectual property in the cyber space, The ethical dimension of cybercrimes, The psychology, Mindset and skills of hackers and cyber criminals, Sociology of cyber criminals, Information warfare.

Cyber Crime Illustrations: Indian banks lose millions of rupees, Justice vs. Justice, Parliament attack, The Indian case of online gambling, Bank and credit card related frauds, Purchasing goods and services scam, Nigerian 419 scam.

Total Periods: 45

TEXT BOOK:

1. Nina Gobole and SunitBelapure, *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives,* Wiley India, 2011.

REFERENCE BOOK:

1. Prashant Mali, *Cyber Law and Cyber Crimes,* Snow White Publications Pvt. Ltd., 2013.

IV B.Tech. - I Semester

(16BT61505) **BIO-INFORMATICS**

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: —

COURSE DESCRIPTION:
Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Biological Database; Homology Modeling; Structure Prediction; Molecular Dynamics.

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

CO1. demonstrate knowledge on concepts of biological databases, Genome and proteome.
CO2. analyze biological sequences for Homology Modeling.
CO3. apply clustering methods for Phylogenetic trees.
CO4. solve bio sequencing problems using dynamic programming.
CO5. select and apply appropriate techniques and tools to structure Prediction.

DETAILED SYLLABUS:

UNIT-I: NUCLEIC ACIDS, PROTEINS AND AMINO ACIDS (08 periods)

Bioinformatics - Definition, Nucleic acid structure, Protein structure, the central dogma, Physico-chemical properties of the amino acids and their importance in protein folding, Polymerase chain reaction (PCR)

UNIT-II: INFORMATION RESOURCES FOR GENES AND PROTEIN (10 periods)

Database file formats, Nucleic acid sequence databases, Protein sequence databases.

Sequence Alignment Algorithm

Pair wise sequence alignment – The problem, Pair wise sequence alignment – Dynamic programming methods, The effect of scoring parameters on the alignment, Multiple sequence alignment.

UNIT-III: PREDICTION OF THE THREE-DIMENSIONAL STRUCTURE OF A PROTEIN AND HOMOLOGY MODELING (09 Periods)

Secondary Structure Prediction, Basic Principles, The Steps of Comparative Modeling, Accuracy of Homology Models, Manual versus Automatic Models, SNPs, Motifs**.**

UNIT-IV: PHYLOGENETIC METHODS (10 periods)

Phylogenetic trees, choosing sequences, Distance matrices and clustering methods, Calculation of distances in the neighbor-joining method, Bootstrapping, Tree optimization criteria and tree search methods, The maximum-likelihood criterion, Calculating the likelihood of the data on a given tree, The parsimony criterion.

UNIT-V: NEW FOLD MODELING (08 periods)

Estimating the Energy of a Protein Conformation, Energy Minimization, Molecular Dynamics, The "Omics" Universe-Transcriptomics, Proteomics, Interactomics, Structural Genomics, Pharmacogenomics.

TEXTBOOKS:

1. Paul G. Higgs and Teresa K. Attwood, *Bioinformatics and Molecular Evolution* Blackwell Publishing, 2005.
2. Anna Tramontano, *Introduction to Bioinformatics* Chapman and Hall/CRC, 2006.

REFERENCE BOOKS:

1. Hooman H. Rashidi and Lukas K. Buehler, *Bioinformatics Basics, Applications in Biological Science and Medicine*, CRC Press, Taylor & Francis Group, 2nd edition, 2005.
2. Rastogi S. C., NamitaMendiratta and ParagRastogi, *Bioinformatics: Methodsand Applications: Genomics, Proteomics and Drug Discovery*, PHI Learning Pvt. Ltd., 3rd edition, 2011.

IV B.Tech. - I Semester

(16BT70231) **POWER SYSTEM - II LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PREREQUISITES: Courses on Matrices and Numerical Methods, Electric Circuits and Transmission & Distribution.

COURSE OUTCOMES: on successful completion of the course, students will be able to

CO1. demonstrate knowledge on
- formation of network matrices and parameters of power system.
- various load flow methods and faults.
- load frequency control and stability of power system.

CO2. analyze
- the formation of power system network matrices.
- the power flow solutions using various load flow techniques.
- various types of power system faults.
- load frequency problem.
- stability for the stable operation of power system.

CO3. design a suitable operating and control strategy to meet the required specifications of power system.

CO4. develop programming skills to solve and simulate power system problems to provide viable solution.

CO5. select and apply appropriate technique for solving complex problems in the power systems.

CO6. apply the conceptual knowledge of power systems in relevance to industry and society.

CO7. commit to ethical principles and standards while exercising the practical investigations on power system.

CO8. work individually or in a group in the field of power systems.

CO9. communicate effectively in verbal and written form in power system domain.

LIST OF EXPERIMENTS:

Conduct any **TEN** experiments using MATLAB/SIMULINK/PSCAD/ MiPower/PSIM.

1. Determination of load parameters from load curve.
2. Determination of transmission line parameters.
3. Formation of Ybus.
4. Formation of Zbus.

5. Load flow analysis.
6. Fault analysis.
7. Rotor dynamics using swing equation.
8. Transient stability analysis.
9. Economic dispatch problem.
10. Modeling, simulation and analysis of AVR.
11. Modeling, simulation and analysis of LFC in an interconnected power system.
12. Power quality problems.
13. Determination of transformer inrush current.
14. Simulation of capacitor switching transients.
15. Demonstration of soft computing techniques tool boxes (ANN, FUZZY, GA).

IV B.Tech. - I Semester

(16BT70432) **EMBEDDED SYSTEMS LAB**

(Common to EEE, ECE and CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Course on Embedded systems.

COURSE DESCRIPTION:
IDE for Embedded System Design using MSP430; Interfacing Switch & LED; Timers-WDT, Configuring, Programming; ADC-usage; Power down modes; DAC; PWM Generator; Networking - SPI, Wi-Fi.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

CO1. demonstrate knowledge in designing complex energy efficient embedded systems.
CO2. analyze usage of various on-chip resources like GPIO, Timers, Interrupts, ADC, DAC, Comparator, SPI.
CO3. design embedded systems to suit market requirements.
CO4. solve engineering problems by proposing potential solu tions using industry choice advanced Microcontrollers.
CO5. apply appropriate techniques, resources, and CCSV6 based IDE for modeling embedded systems with under standing of limitations.
CO6. provide embedded system solutions for societal needs.
CO7. work individually and in a group to develop embedded systems.
CO8. communicate effectively in oral and written form in the field of embedded systems.

LIST OF EXCERSISES:

1. Introduction to MSP430 launch pad and Programming Environment.
2. Read input from switch and Automatic control/flash LED (software delay).
3. Interrupts programming example using GPIO.
4. Configure watchdog timer in watchdog & interval mode.
5. Configure timer block for signal generation (with given fre quency).
6. Read Temperature of MSP430 with the help of ADC.
7. Test various Power Down modes in MSP430.
8. PWM Generator.
9. Use Comparator to compare the signal threshold level.
10. Speed Control of DC Motor

11. Master slave communication between MSPs using SPI.
12. Networking MSPs using Wi-Fi.

TOOL REQUIREMENT:

Code Composer Studio Version 6, MSP430 based launch pads, Wi-Fi booster pack.

REFERENCE BOOKS:

1. John H Davies, *MSP430 Microcontrollers Basics*, Newnes Publishers, 1st edition, 2008.
2. C P Ravikumar, *MSP430 Microcontrollers in Embedded System Projects*, Elite Publishing House , 1st edition, 2012.

IV B.Tech. – I Semester
(16BT70232) **COMPREHENSIVE ASSESSMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	100	100	-	-	-	2

COURSE DESCRIPTION: Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES:
Comprehensive Assessment enables a successful student to demonstrate:

CO1. knowledge in the courses of the program.
CO2. analytical ability in the courses of the program.
CO3. design skills in the courses of the program.
CO4. ability to investigate and solve complex engineering problems in the courses of the program.
CO5. ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the courses of the program.
CO6. ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.
CO7. understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development in the courses of the program.
CO8. ability to apply ethics and norms of the engineering practice in the courses of the program.
CO9. ability to function effectively as an individual in the courses of the program.
CO10. ability to present views cogently and precisely in the courses of the program.
CO11. ability to engage in life-long leaning in the courses of the program.

IV B.Tech. - II Semester
(16BT80231) **PROJECT WORK**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PREREQUISITES: All the courses of the program.

COURSE DESCRIPTION:
Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES:
Completion of the project work enables a successful student to demonstrate:

CO1. knowledge on the project topic.
CO2. analytical ability exercised in the project work.
CO3. design skills applied on the project topic.
CO4. ability to investigate and solve complex engineering problems faced during the project work.
CO5. ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the project work.
CO6. ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues considered in the project work.
CO7. understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development experienced during the project work.
CO8. ability to apply ethics and norms of the engineering practice as applied in the project work.
CO9. ability to function effectively as an individual as experienced during the project work.
CO10. ability to present views cogently and precisely on the project work.
CO11. project management skills as applied in the project work.
CO12. ability to engage in life-long leaning as experience during the project work.

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

Sree Sainath Nagar, A.Rangampet, Near Tirupati - 517 102. A.P.

Salient Features of Prohibition of Ragging in Educational Institutions Act 26 of 1997

- Ragging within or outside the College is prohibited.
- Ragging means doing an act which causes or is likely to cause insult or annoyance or fear or apprehension or threat or intimidation or outrage of modesty or injury to a student

Nature of Ragging	Punishment
Teasing, Embarrassing and humiliating	Imprisonment up to 6 months or fine up to Rs. 1,000/- or Both
Assaulting or using criminal force or criminal intimidation	Imprisonment up to 1 year or fine up to Rs. 2,000/- or Both
Wrongfully restraining or confining or causing hurt	Imprisonment up to 2 years or fine up to Rs. 5,000/- or Both
Causing grievous hurt, Kidnapping or rape or committing unnatural offence	Imprisonment up to 5 years or fine up to Rs. 10,000/-
Causing death or abetting suicide	Imprisonment up to 10 years or fine up to Rs. 50,000/-

Note:

1. A student convicted of any of the above offences, will be expelled from the College.
2. A student imprisoned for more than six months for any of the above offences will not be admitted in any other College.
3. A student against whom there is prima facie evidence of ragging in any form will be suspended from the College immediately.
4. The full text of Act 26 of 1997 **and** UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009 **(Dated 17th June, 2009) are placed in the College library for reference.**