

**AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY  
(AUTONOMOUS)**

(Approved by AICTE | Accredited by NAAC | Affiliated to JNTUA)  
Gudur, Nellore Dist - 524101, A.P (India)



**OUTCOME BASED EDUCATION  
WITH  
CHOICE BASED CREDIT SYSTEM**

**BACHELOR OF TECHNOLOGY**

**ACADEMIC REGULATIONS  
UNDER AUTONOMOUS STATUS**

**DEPARTMENT OF  
ELECTRICAL AND ELECTRONICS ENGINEERING**

**B.Tech Regular Four Year Degree Programme  
(for the batches admitted from the academic year 2018 - 2019)**

**&**

**B.Tech (Lateral Entry Scheme)  
(for the batches admitted from the academic year 2019 - 2020)**

**FAILURE TO READ AND UNDERSTAND THE REGULATIONS  
IS NOT AN EXCUSE**

## **CONTENTS**

<b>S. No</b>	<b>Description</b>	<b>Page No.</b>
1	Preliminary Definitions and Nomenclatures	4
2	Foreword	6
3	Choice Based Credit System	7
4	Eligibility for Admission	8
5	Duration of Programme	8
6	Medium of Instruction	8
7	Semester Structure	10
8	Registration	10
9	Unique Course Identification Code	11
10	Curriculum and Course Structure	11
11	Division of marks for Internal and External Assessment	17
12	Evaluation Methodology	17
13	Grading Procedure	23
14	Award of Class	26
15	Conduct of Semester End Examinations and Evaluation	26
16	Supplementary Examinations	26
17	Attendance Requirements and Detention Policy	27
18	Promotion Rules	27
19	Graduation Requirements	28
20	Revaluation	28
21	Temporary Break of Study from the Programme	28
22	Termination from the Program	29
23	With-holding of Results	29
24	Student Transfers	29
25	Graduation Day	29
26	Conduct and Discipline	29
27	Grievance Redressal Committee	30
28	Transitory Regulations	30
29	Revision of Regulations and Curriculum	32
30	Program outcomes	33
31	Frequently asked Questions and Answers about autonomy	34
32	Malpractices Rules	39

**One best book is equal to hundred good friends, but one good friend is equal to a library.**

**All of us do not have equal talent, but all of us have an equal opportunity to develop our talents**

**“This is the way to success”**

**Dr.A.P.J.Abdul Kalam**

## **VISION AND MISSION OF THE INSTITUTE**

### **VISION**

To make Audisankara College of Engineering & Technology a centre of academic excellence where 21<sup>st</sup> century innovative minds manage with novel ideas & spread out new technologies relevant in meeting the social needs with increased employment opportunities and changed life style.

### **MISSION**

To provide the students with Technological direction and support, acclaimed in latest cutting edge technologies with a blend of academic concepts and practical nuances in hot areas of Engineering and Technology so that they develop all the resourcefulness, competence and confidence to take on the technological challenges of tomorrow.

## PRELIMINARY DEFINITIONS AND NOMENCLATURES

**Academic Council:** The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

**Academic Autonomy:** Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

**Academic Year:** It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., (one odd + one even) and one supplementary semester.

**AICTE:** Means All India Council for Technical Education, New Delhi.

**Autonomous Institute:** Means an institute designated as autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University, Ananthapuramu) and State Government.

**Backlog Course:** A course is considered to be a backlog course if the student has obtained a failure grade (F) in that course.

**Basic Sciences:** The courses offered in the areas of Mathematics, Physics, Chemistry, English etc., are considered to be foundational in nature.

**Betterment:** Betterment is a way that contributes towards improvement of the student's grade in any course(s). It can be done by either (a) re-appearing or (b) re-registering for the course.

**Board of Studies (BOS):** BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

**Branch:** Means specialization in a program like B.Tech degree program in Mechanical Engineering, B.Tech degree program in Computer Science and Engineering etc.

**Certificate Course:** It is a course that makes a student gain hands-on expertise and skills required for holistic development in a specific area/field.

**Choice Based Credit System:** The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

**Compulsory course:** Course required to be undertaken for the award of the degree as per the program.

**Commission:** Means University Grants Commission (UGC), New Delhi.

**Continuous Internal Examination:** It is an examination conducted towards sessional assessment.

**Course:** A course is a subject offered by a department for learning in a particular semester.

**Course Outcomes:** The essential skills that need to be acquired by every student through a course.

**Credit:** A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial hour per week.

**Credit point:** It is the product of grade point and number of credits for a course.

**Cumulative Grade Point Average (CGPA):** It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

**Curriculum:** Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

**Department:** An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff and other resources in the process of study for a degree.

**Dropping from the Semester:** A student who doesn't want to register for any semester can apply in writing in prescribed format before commencement of that semester.

**Elective Course:** A course that can be chosen from a set of courses. An elective can be Professional Elective and/or Open Elective.

**Evaluation:** Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

**Grade:** It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

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

**Institute:** Means AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY, Gudur, Nellore Dist, Andhra Pradesh unless indicated otherwise by the context.

**Massive Open Online Course (MOOC):** MOOC courses inculcate the habit of self learning. MOOC courses would be additional choices in all the elective group courses.

**Pre-requisite:** A course, the knowledge of which is required for registration into higher level course.

**Core:** The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

**Professional Elective:** It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

**Program:** Means, Bachelor of Technology (B.Tech) degree program / PG degree program: Master of Technology (M.Tech) / Master of Business Administration (MBA) / Master of Computer Applications (MCA).

**Program Educational Objectives:** The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

**Project work:** It is a design or research based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.

**Re-Appearing:** A student can reappear only in the semester end examination for the theory component of a course, subject to the regulations contained herein.

**Registration:** Process of enrolling into a set of courses in a semester of a Program.

**Regulations:** The regulations, common to all B.Tech programs offered by Institute are designated as "ASCET Regulations R-16" and are binding on all the stakeholders.

**Semester:** It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. The odd Semester starts usually in July and even semester in December.

**Semester End Examinations:** It is an examination conducted for all courses offered in a semester at the end of the semester.

**S/he:** Means "she" and "he" both.

**Student Outcomes:** The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

**University:** Means the Jawaharlal Nehru Technological University Anantapur, Ananthapuramu.

## **FOREWORD**

The autonomy is conferred to AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY, (ASCET) Gudur, Nellore Dist, Andhra Pradesh by University Grants Commission (UGC), New Delhi based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like J N T University Anantapur (JNTUA), Ananthapuramu and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own curriculum, examination system and monitoring mechanism, independent of the affiliating University but under its observance.

AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the institute and recommendations of the JNTUA to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the institute to order to produce a quality engineering graduate to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

**PRINCIPAL**



**AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY  
(AUTONOMOUS)  
Gudur, Nellore Dist - 524101, A.P (India)**

**ACADEMIC REGULATIONS**

**B.Tech. Regular Four Year Degree Programme  
(For the batches admitted from the academic year 2018 - 19)  
&  
B.Tech. (Lateral Entry Scheme)  
(For the batches admitted from the academic year 2019 - 20)**

For pursuing four year undergraduate Bachelor Degree programme of study in Engineering (B.Tech) offered by AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY under Autonomous status and herein after referred to as ASCET.

**1.0 CHOICE BASED CREDIT SYSTEM**

The Indian Higher Education Institutions (HEI's) are changing from the conventional course structure to Choice Based Credit System (CBCS) along with introduction to semester system at first year itself. The semester system helps in accelerating the teaching-learning process and enables vertical and horizontal mobility in learning.

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

Choice Based Credit System (CBCS) is a flexible system of learning and provides choice for students to select from the prescribed elective courses. A course defines learning objectives and learning outcomes and comprises of lectures / tutorials / laboratory work / field work / project work / comprehensive Examination / seminars / assignments / alternative assessment tools / presentations / self-study etc. or a combination of some of these.

Under the CBCS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

The CBCS permits students to:

- Choose electives from a wide range of elective courses offered by the departments.
- Undergo additional courses of interest.
- Adopt an interdisciplinary approach in learning.
- Make the best use of expertise of the available faculty.

## **2.0 ELIGIBILITY FOR ADMISSION**

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

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

➤ Under Category A: 70% of the seats are filled through EAMCET counseling.

➤ Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE.

**2.2** Admission eligibility-Under Lateral Entry Scheme Students with diploma qualification have an option of direct admission into 2<sup>nd</sup> year B. Tech. (Lateral entry scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats. Admissions to this three year B Tech later entry Programme will be through ECET. The maximum period to complete B. Tech. under lateral entry scheme is six consecutive academic years from the date of joining.

## **3.0 DURATION OF PROGRAMME**

The course duration for the award of the Degree in **Bachelor of Technology** will be four academic years, with two semesters in each year. However if a student is unable to complete the course within 4 years, he/ she can do so by giving more attempts but within 8 consecutive academic years from the date of admission.

### **Academic Calendar**

For all the eight semesters a common academic calendar shall be followed in each semester by having sixteen weeks of instruction, one week for the conduct of practical exams and with three weeks for theory examinations and evaluation. Dates for registration, sessional and end semester examinations shall be notified in the academic calendar of every semester. The schedule for the conduct of all the curricular and co-curricular activities shall be notified in the planner.

## **4.0 MEDIUM OF INSTRUCTION**

The medium of instruction shall be English for all courses, examinations, seminar presentations and project work. The curriculum will comprise courses of study as given in course structure, in accordance with the prescribed syllabi.

## **5.0 BRANCHES OF STUDY**

- Civil Engineering (CE)
- Electrical & Electronics Engineering (EEE)
- Mechanical Engineering (ME)
- Electronics & Communication Engineering (ECE)
- Computer Science & Engineering (CSE)

## **6.0 TYPES OF COURSES**

### **6.1 Foundation / Skill Course:**

Foundation courses are the courses based upon the content leads to enhancement of skill and knowledge as well as value based and are aimed at man making education. Skill subjects are those areas in which one needs to develop a set of skills to learn anything at all. They are fundamental to learning any subject.

### **6.2 Core Course:**

There may be a core course in every semester. This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

### **6.3 Elective Course:**

Electives provide breadth of experience in respective branch and applications areas. Elective course is a course which can be chosen from a pool of courses. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student's proficiency/skill.

An elective may be discipline centric (Professional Elective) focusing on those courses which add generic proficiency to the students or may be chosen from an unrelated discipline called as "Open Elective".

There are four professional elective groups; students can choose not more than two courses from each group. Overall, students can opt for four professional elective courses which suit their project work in consultation with the faculty advisor/mentor. Nevertheless, one course from each of the two open electives has to be selected.

### **6.4 Mandatory Course:**

For mandatory courses like Induction Training, Environmental Sciences, Indian Constitution, Essence of Indian Traditional Knowledge, a student has to secure 40 marks out of 100 marks (i.e 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course. For **Mandatory** courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

### **6.5 Activity Point Programme (APP):**

For Activity Point Programme (APP) courses like Professional Society Activities, Communication Skills Practice, Soft Skills Practice, Quantitative Aptitude and Technical Aptitude, a student has to secure 40 marks out of 100 marks (i.e 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course. For **APP** courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

### **6.6 NCC/ NSO and NSS Courses:**

For the courses of NCC / NSO and NSS, a satisfactory participation certificate shall be issued to the student from the authorities concerned.

## 6.7 Mandatory/ Non-credit Courses Marks/Grade:

No marks or letter grade shall be allotted for all mandatory/non-credit courses.

## 7.0 SEMESTER STRUCTURE

Each academic year is divided into two semesters, TWO being MAIN SEMESTERS (one odd + one even). Main Semesters are for regular class work. However, the following cases are exempted:

- 7.1 Students admitted on transfer from JNTUA affiliated institutes, Universities and other institutes in the subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.
- 7.2 Each main semester shall be of 21 weeks (Table 1) duration and this period includes time for registration of courses, course work, examination preparation and conduct of examinations.
- 7.3 Each main semester shall have a minimum of 90 working days; out of which number of contact days for teaching / practical are 75 and 15 days for conduct of exams and preparation.
- 7.4 The academic calendar shown in Table 1 is declared at the beginning of the academic year.

**Table 1: Academic Calendar**

<b>FIRST SEMESTER (21 weeks)</b>	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations	2 weeks	
<b>Semester Break and Supplementary Examinations</b>			2 weeks
<b>SECOND SEMESTER (21 weeks)</b>	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation & Practical Examinations	1 week	
	Semester End Examinations	2 weeks	
<b>Summer Vacation and Supplementary Examinations</b>			8 weeks

## 8.0 REGISTRATION

- 8.1 Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely compulsory for the student to register for courses in time. The registration will be organized departmentally under the supervision of the Head of the Department.
- 8.2 IN ABSENTIA registration will not be permitted under any circumstance.

**8.3** At the time of registration, students should have cleared all the dues of Institute and Hostel in the previous semesters, paid the prescribed fees for the current semester and not been debarred from institute for a specified period on disciplinary or any other ground.

### **9.0 UNIQUE COURSE IDENTIFICATION CODE**

Every course of the B.Tech program will be placed in one of the four groups of courses as listed in the Table 2. The various courses and their two-letter codes are given below;

**Table 2: Group of Courses**

<b>S. No</b>	<b>Branch</b>	<b>Code</b>
1	Civil Engineering	01
2	Electrical & Electronics Engineering	02
3	Mechanical Engineering	03
4	Electronics & Communication Engineering	04
5	Computer Science & Engineering	05

### **10.0 CURRICULUM AND COURSE STRUCTURE**

The curriculum shall comprise Foundation/ Skill Courses, Core Courses, Elective Courses, Open Electives, Laboratory Courses, Technical Seminar, Term Paper, Communication Skills Practice, Soft Skills Practice, Professional Society Activities, Mini Project, Internship and Major Project and Comprehensive Viva-Voce. The list of elective courses may include subjects from allied disciplines also.

**Contact Periods:** Depending on the complexity and volume of the course, the number of contact periods per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours/week as follows:

- Contact Classes (Theory): 1 credit per lecture hour per week.
- Tutorial Classes (Theory): 1 credit per 2 lecture hours per week.
- Laboratory Hours (Practical): 1 credit for 2 Practical hours.
- Full Semester Internship: 19 credits for 40 hours per week

### **10.1 Credit distribution for courses offered is shown in Table 3.**

**Table 3: Credit distribution**

S. No	Course	Hours	Credits
1	Theory Course (Core/Foundation/Elective)	3	3
2	Theory Course (Core/Foundation/Elective)	4	4
3	Theory Course (Core/Foundation/Elective)	3	3
4	Open Elective Courses	2	2
5	Drawing Courses	1+4	3
6	MOOC Courses	3	3
7	Laboratory Courses	4	2
8	Laboratory Courses	2	1
9	Technical Seminar	2	1
10	Term Paper	2	1
11	Project Work Phase-I	4	2
12	Comprehensive Assessment	2	1
13	Project Work Phase-II	20	10
14	Mandatory Courses	2	0
15	Full Semester Internship	40	19
16	Professional Society Activities	2	0
17	Soft Skills Practice	2	0
18	Communication Skills Practice	2	0
19	Quantitative Aptitude	2	0
20	Technical Aptitude	2	0

## 10.2 Course Structure

Every program of study shall be designed to have 42 theory courses and 20 laboratory courses. Every course of the B.Tech program will be placed in one of the eight categories with minimum credits as listed in the Table 4. In addition, a student has to carry out a Project Work Phase-I, Project Work Phase-II and Comprehensive Assessment.

**Table 4: Category Wise Distribution of Credits**

S. No	Category	Subject Area and % of Credits	Average No. of Credits
1	Humanities and Social Sciences (HS), including Management.	HS (05% to 10%)	<b>08</b>
2	Basic Sciences (BS) including Mathematics, Physics and Chemistry.	BS (10% to 15%)	<b>19</b>
3	Engineering Sciences (ES), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	ES (10% to 15%)	<b>20</b>
4	Professional Subjects - Core (PC), relevant to the chosen	PC (40% to 50%)	<b>74</b>

	specialization/branch.		
5	Professional Subjects - Electives (PE), relevant to the chosen specialization/branch.	PE (10% to 15%)	<b>18</b>
6	Open Subjects - Electives (OE), from other technical and/or emerging subject areas.	OE (01% to 5%)	<b>06</b>
7	Project Work and Comprehensive Viva-Voce, Mini Project and Internship	5% to 10%	<b>13</b>
8	Technical Seminar and Term Paper	CRT	<b>02</b>
<b>TOTAL</b>			<b>160</b>

### 10.3 For Four year regular programme (Non FSI):

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
B.Tech I Semester	5 Foundation	Induction Training + 3	20
B.Tech II Semester	5 Foundation	3	20
B.Tech III Semester	5 + 1 (2 Credit Course)	3 + Mandatory Course	20
B.Tech IV Semester	5 + 1 (2 Credit Course)	3 + Technical Seminar	21
B.Tech V Semester	5 + OE-I (2 Credit Course)	3 + Mandatory Course	20
B.Tech VI Semester	5 + OE-II (2 Credit Course)	3 + Term Paper	21
B.Tech VII Semester	4 + OE-III (2 Credit Course)	3 + Comprehensive Assessment + PW Phase-I	19
B.Tech VIII Semester	3	Project Work Phase-II	19
Total	42	20+TS+TP+ Project Work Phase-I + Comprehensive Assessment + Project Work Phase-II	160

### 10.4 For Four year regular programme (FSI):

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
B.Tech I Semester	5 Foundation	Induction Training + 3	20
B.Tech II Semester	5 Foundation	3	20
B.Tech III Semester	5 + 1 (2 Credit Course)	3 + Mandatory Course	20
B.Tech IV Semester	5 + 1 (2 Credit Course)	3 + Technical Seminar	21
B.Tech V Semester	5 + OE-I (2 Credit Course)	3 + Mandatory Course	20

B.Tech VI Semester	5 + OE-II (2 Credit Course)	3 + Term Paper	21
B.Tech VII Semester	4 + OE-III (2 Credit Course)	3 + Comprehensive Assessment + PW Phase-I	19
B.Tech VIII Semester	Full Semester Internship		19
Total	39	20+TS+TP+ Project Work Phase-I + Comprehensive Assessment + Full Semester Internship	160

### 10.5 For Three year lateral entry programme (Non FSI):

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
B.Tech III Semester	5 + 1 (2 Credit Course)	3 + Mandatory Course	20
B.Tech IV Semester	5 + 1 (2 Credit Course)	3 + Technical Seminar	21
B.Tech V Semester	5 + OE-I (2 Credit Course)	3 + Mandatory Course	20
B.Tech VI Semester	5 + OE-II (2 Credit Course)	3 + Term Paper	21
B.Tech VII Semester	4 + OE-III (2 Credit Course)	3 + Comprehensive Assessment + PW Phase-I	19
B.Tech VIII Semester	3	Project Work Phase-II	19
Total	32	14 + TS + TP + Project Work Phase-I + Comprehensive Assessment + Project Work Phase-II	120

### 10.6 For Three year lateral entry programme (FSI):

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
B.Tech III Semester	5 + 1 (2 Credit Course)	3 + Mandatory Course	20
B.Tech IV Semester	5 + 1 (2 Credit Course)	3 + Technical Seminar	21
B.Tech V Semester	5 + OE-I (2 Credit Course)	3 + Mandatory Course	20
B.Tech VI Semester	5 + OE-II	3 + Term Paper	21

	(2 Credit Course)		
B.Tech VII Semester	4 + OE-III (2 Credit Course)	3 + Comprehensive Assessment + PW Phase-I	19
B.Tech VIII Semester	Full Semester Internship		19
Total	29	14 + TS + TP + Project Work Phase-I + Comprehensive Assessment + Full Semester Internship	120

### 10.7 Course wise break-up for Regular program:

<b>Total Theory Courses - 42</b> (35 Foundation and Core + 6 Professional Electives + 3 Open Elective)	2 @ 4 credits each 35 @ 3 credits each 5 @ 2 credits each	123
Laboratory Courses – 20	2 @ 2 credits each 18 @ 1 credits each	22
Technical Seminar	1 @ 1 credit	01
Term Paper with self study report	1 @ 1 credit	01
Comprehensive Assessment	1 @ 1 credit	01
Project Work Phase-I	1 @ 2 credit	02
Project Work Phase-II	1 @ 10 credits	10
<b>TOTAL CREDITS</b>		<b>160</b>

### 10.8 Course wise break-up for three year lateral entry program :

<b>Total Theory Courses - 32</b> (35 Foundation and Core + 6 Professional Electives + 3 Open Elective)	27 @ 3 credits each 5 @ 2 credits each	91
Laboratory Courses – 14	14 @ 1 credit	14
Technical Seminar	1 @ 1 credit	01
Term Paper with self study report	1 @ 1 credit	01
Comprehensive Assessment	1 @ 1 credit	01
Project Work Phase-I	1 @ 2 credit	02
Project Work Phase-II	1 @ 10 credits	10
<b>TOTAL CREDITS</b>		<b>120</b>

### 11.0 DIVISION OF MARKS FOR INTERNAL AND EXTERNAL ASSESSMENT

Name of the Course	Continuous Internal Assessment (CIA)	Semester End Examination (SEE)
Theory	30	70
Laboratory	25	50
Technical Seminar	50	-
Term Paper	50	-
Comprehensive Assessment	100	-
Project Work Phase-I	50	50
Project Work Phase-II	60	140
Full Semester Internship	200	300

## 12.0 EVALUATION METHODOLOGY

The performance of a student in each semester shall be evaluated through Continuous Internal Assessment (CIA) and / or an Semester End Examination (SEE) conducted semester wise.

### 12.1 Theory Course:

The performance of a student in every theory course shall be evaluated for total of 100 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 30 marks and 70 marks respectively.

### 12.2 Practical Course:

The performance of a student in every practical course shall be evaluated for total of 75 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 25 marks and 50 marks respectively.

### 12.3 Internal Evaluation for Theory Course:

The total internal weightage for theory courses is 30 marks with the following distribution.

- 20 marks for Mid-Term Examination
- 10 marks for Assignment Test

While the first mid-term examination shall be conducted on the 50% of the syllabus (Unit-I, Unit-II & 50% of Unit-III), the second mid-term examination shall be conducted on the remaining 50% of the syllabus (50% of Unit III, Unit-IV & Unit-V).

10 marks are allocated for assignment test (as specified by the subject teacher concerned). The first assignment should be conducted after completion of Unit-I & Unit-II for 5 marks and the second assignment should be conducted after completion of Unit-III & Unit-IV for 5 marks. The final Assignment Test marks will be the addition of these two.

Two midterm examinations each for **20 marks** with the duration of 90 minutes each will be conducted for every theory course in a semester. The midterm examination marks shall be awarded giving a weightage of 80% in the midterm examination in which the student scores better performance and 20% in the remaining midterm examination.

The final mid-term marks obtain by the addition of these two (80% + 20%).

**Example:** If a student scores 23 marks and 24 marks in the first and second mid-term

examinations respectively, then Weighted Average Marks =  $24 \times 0.8 + 23 \times 0.2 = 23.8$ , rounded to 24 Marks.

**Note:** The marks of any fraction shall be rounded off to the next higher mark.

#### **12.4 Pattern of the midterm examination question paper is as follows:**

- A total of two Sections (Section-I & Section-II)
- Section-I contains three one mark questions. One questions from each unit and a student has to be answered two questions (2X1=2 Marks)
- Section-II contains six questions are to be designed taking two questions from each unit (Unit wise – Either or type) of the three units.. (3X6=18 Marks)

#### **Pattern of the Assignment Test is as follows:**

- Five assignment questions are given in advance, out of which two questions given by the concerned teacher has to be answered during the assignment test
- Sum of Assignment Tests marks is considered.

**Note:** A student who is absent for any Mid-Term Examination/ Assignment Test, for any reason whatsoever, shall be deemed to have scored zero marks in that Mid-Term Examination/ Assignment Test and no make-up test shall be conducted.

#### **12.5 Internal Evaluation for Practical Course:**

For practical subjects there shall be a Continuous Internal Evaluation during the semester for 25 internal marks. Out of the 25 marks for internal evaluation, day-today assessment in the laboratory shall be evaluated for 10 marks and internal practical examination shall be evaluated for 15 marks conducted by the laboratory teacher concerned.

#### **12.6 Internal Evaluation for Design/ Drawing Courses:**

For the subject having design and/or drawing, (such as engineering graphics, engineering drawing, machine drawing, production drawing and building drawing) the internal marks distribution shall be 10 marks for day-to-day performance and 20 marks for Mid-Term Examinations.

#### **12.7 Internal Evaluation for Technical Seminar:**

There shall be a Technical seminar presentation in B.Tech IV Semester. A Technical Seminar shall have two components, one chosen by the student from the course work as an extension and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar topics shall be made before a committee consisting of Head of the department, seminar supervisor and a senior faculty member. Each Technical Seminar shall be evaluated for 50 marks. Technical Seminar component-I for 25 marks and component-II for 25 marks making total 50 marks. (**Distribution of marks for 25:** 5 marks for report, 5 marks for subject content, 10 marks for presentation and 5 marks for queries).

#### **12.8 Internal Evaluation for Term Paper:**

The Term Paper is a self study report and shall be carried out either during B.Tech VI Semester along with other lab courses. Every student will take up this term paper individually and submit a report. The scope of the term paper could be an exhaustive literature review choosing any engineering concept with reference to standard research

papers or an extension of the concept of earlier course work in consultation with the term paper supervisor. The term paper reports submitted by the individual students during the B.Tech VI Semester shall be evaluated for a total of 50 marks for continuous assessment, it shall be conducted by two Examiners, one of them being term paper supervisor as Examiner-1 and an Examiner-2 nominated by the Principal from the panel of experts recommended by HOD.

### **12.9 Project Work:**

The Project work is spread over to two semesters having Project Work Phase-I and Project Work Phase-II. Project Work Phase-I is included in B.Tech VII Semester and Project Work Phase-II in B.Tech VIII Semester as detailed below:

A student has to select topic of his Project Work based on his interest and available facilities, in the B.Tech VII semester which he will continue through B.Tech VIII semester also.

### **12.10 Internal Evaluation for Project Work Phase-I:**

The object of Project Work Phase-I is to enable the student to take up investigative study in the broad field of his branch of Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the department on an individual basis or three/four students in a group under the guidance of a supervisor/guide. This is expected to provide a good initiation for the student(s) in R&D work.

*The assignment normally includes:*

- Survey and Study of published literature of on the assigned topic.
- Working out a preliminary approach to the problem relating to the assigned topic.
- Conducting preliminary analysis/ modeling/simulation/experiment/ design/ feasibility.
- Preparing a written report on the study conducted for presentation to the department.
- Final seminar presentation before Project Review Committee.

The supervisor/ guide will evaluate the execution of the project periodically.

Project Work Phase-I is allocated 100 marks with 2 credits. Out of 100, 25 marks are allocated for the supervisor/guide to be awarded based on periodical project reviews and submission of the report on the work done. 25 marks are allocated for the supervisor/guide and head of the department to be awarded based on seminar given by each student on the topic of the project. The other 50 marks shall be awarded on the basis of his presentation on the work done on his project by the Departmental committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.

The candidate is declared to have passed in Project work Phase-I when he gets 40% marks given by the Departmental Committee and 50% marks overall.

### **12.11 Internal Evaluation for Project Work Phase-II:**

The Project work Phase-II will be an extension of Phase-I project work. The object of Project work phase-II is to enable the student to extend further the investigative study

taken up as the project in Phase-I under the guidance of the supervisor/ guide from the department.

*The assignment normally includes:*

- Preparing an action plan for conducting the investigation including the team work.
- In depth study of the topic assigned.
- Review and finalization of the approach to the problem relating to the assigned topic.
- Final development of product/process, testing, results, conclusions and further direction.
- Preparing a paper for conference presentation/ publication in journal if possible.
- Preparing a dissertation in the standard format for being evaluated by the department.
- Final presentation of the work done before the Project Review Committee (PRC).

Project Work Phase-II is allocated 50 internal marks. Out of 50, 25 marks are allocated for the supervisor/guide and head of the department to be evaluated based on two seminars given by each student on the topic of the project. The other 25 marks shall be evaluated on the basis of his presentation on the work done on his project by the Departmental Committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.

#### **12.12 Internal Evaluation for Full Semester Internship:**

Internship course is 200 marks for continuous internal assessment and will be evaluated based on day to day assessment by concern industry.

**Following are the evaluation guidelines:**

- Profile and abstract –Student has to submit the industry profile and abstract of the project within four weeks from date of commencement of internship through mail or post.  
Weightage: 40 Marks
- Seminar 1 - at 9<sup>th</sup> week from date of commencement of internship - weightage: 50 Marks
- Seminar 2 - Pre submission at 17<sup>th</sup> week from date of commencement of internship – Weightage: 50 Marks
- Internship Diary, weightage: 60 Marks

#### **12.13 External Evaluation for Theory Course - Semester End Examination:**

The Semester End Examination in each theory subject shall be conducted for 3 hours duration at the end of the semester for 70 marks.

**Pattern of the Semester End Examination question paper is as follows:**

- A total of two Sections (Section-I & Section-II)

- Section-I contains five two mark questions. One question from each unit and a student has to be answered all the five questions compulsory (5X2=10 Marks)
  - Section-II contains ten questions are to be designed taking two questions from each unit (Unit Wise - Either or type) of the total five units. (5X12=60 Marks)
- A student has to secure not less than a minimum of 35% of marks (25 marks) exclusively at the Semester End Examinations in each of the theory subjects in which the candidate had appeared. However, the candidate shall have to secure a minimum of 40% of marks (40 marks) in both external and internal components put together to become eligible for passing in the subject.

**12.14 External Evaluation for Theory Course - Semester End Examination:**

The Semester End Examination in each theory subject shall be conducted for 3 hours duration at the end of the semester for 70 marks.

**Pattern of the Semester End Examination question paper is as follows:**

- A total of two Sections (Section-I & Section-II)
- Section-I contains five two mark questions. One question from each unit and a student has to be answered all the five questions compulsory (5X2=10 Marks)
- Section-II contains ten questions are to be designed taking two questions from each unit (Unit Wise - Either or type) of the total five units. (5X12=60 Marks)

A student has to secure not less than a minimum of 35% of marks (25 marks) exclusively at the Semester End Examinations in each of the theory subjects in which the candidate had appeared. However, the candidate shall have to secure a minimum of 40% of marks (40 marks) in both external and internal components put together to become eligible for passing in the subject.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept
30 %	To test the analytical skill of the concept
20 %	To test the application skill of the concept

**12.15 External Evaluation for Practical Course:**

Out of 50 marks **35** marks are allocated for experiment (procedure for conducting the experiment carries 15 marks & readings, calculation and result-20) and **10** marks for viva-voce examination with **5** marks for the record.

Each Semester External Lab Examination shall be evaluated by an Internal Examiner along with an External Examiner appointed by the Principal.

A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% aggregate marks (38 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (25 marks) in the semester external examination.

**12.16 External Evaluation for Project Work Phase-II:**

The Semester End Examination for project work done during VII Semester and VIII Semester for 140 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be conducted at the end of the VIII Semester. The above committee evaluates the project

work report with weightages of 50% of the marks (50 marks) awarded by external examiner, 20% of marks (20 marks) awarded by HOD & 30% of the marks (30 marks) by Project Guide/Supervisor respectively for a total of 100marks. Of the 40 marks for Presentation & Viva-Voce examination, HOD evaluates for 10 marks and external examiner for 30 marks. The evaluation of 140 marks is distributed as given below:

**Distribution of Project Work Marks**

Sl. No.	Criterion	Marks
1	Report	100
2	Presentation & Viva – Voce	40

A candidate shall be declared to have passed in project work phase-II if he secures a minimum of 50% aggregate marks (100 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (70 marks) in the project work phase-II end examination.

**12.17 External Evaluation of Full Semester Internship:**

Full Semester Internship programme carries 19 credits. During Internship, student has to spend one full semester in an identified industry /firm / organization and has to carry out the internship as per the stipulated guidelines of that industry / firm / organization and the institute.

**Following are the evaluation guidelines:**

- Project Report, weightage: 60 Marks
- Final Presentation, weightage: 160 Marks
- Viva-voce, weightage: 80 Marks

The internship shall be evaluated for 500 marks out of which 200 marks for internal evaluation and 300 marks for external evaluation.

The external evaluation based on the report submitted and viva-voce exam for 300 marks by a committee comprising the HOD, Project supervisor and external examiner (Industry/ Academia). A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

FSI shall be open to all the branches in the VII semester. The selection procedure is:

- Choice of the students
- CGPA (> 7.5) upto IV semester with no current arrears and maintains the CGPA of 7.5 till VI Semester

### **12.18 Massive Open Online Courses (MOOCs):**

Meeting with the global requirements, to inculcate the habit of self learning and in compliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

#### **Regulations for MOOCs**

- The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.
- There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses. Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

### **13.0 GRADING PROCEDURE**

Grades will be awarded to indicate the performance of students in each theory subject, laboratory / practicals, Technical Seminar, Term Paper, Project Work Phase-I, Comprehensive Assessment and Project Work Phase-II. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 11 above, a corresponding letter grade shall be given.

- 13.1** As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	S (Superior)	10
80 and less than 90%	A (Excellent)	9
70 and less than 80%	B (Very Good)	8
60 and less than 70%	C (Good)	7
50 and less than 60%	D (Average)	6
40 and less than 50%	E (Pass)	5
Below 40%	F (FAIL)	0
Absent	AB	0

- 13.2** A student who has obtained an ‘F’ grade in any subject shall be deemed to have ‘failed’ and is required to reappear as a ‘supplementary student’ in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier
- 13.3** To a student who has not appeared for an examination in any subject, ‘Ab’ grade will be allocated in that subject, and he is deemed to have ‘failed’. A student will be required to reappear as a ‘supplementary student’ in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.
- 13.4** A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.
- 13.5** A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding ‘credit points’ (CP) are computed by multiplying the grade point with credits for that particular subject/ course.  
Credit points (CP) = grade point (GP) x credits .... For a course
- 13.6** A student passes the subject/ course only when  $GP \geq 5$  (‘E’ grade or above)
- 13.7** ➤ A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.  
➤ For Mandatory courses “Satisfactory” or “Unsatisfactory” shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

### 13.8 Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

where,  $C_i$  is the number of credits of the  $i^{\text{th}}$  subject and  $G_i$  is the grade point scored by the student in the  $i^{\text{th}}$  course.

ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

where “ $S_i$ ” is the SGPA of the  $i^{\text{th}}$  semester and  $C_i$  is the total number of credits in that semester.

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

iv. While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

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

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

#### Example: Computation of SGPA and CGPA

##### Illustration for SGPA

Course	Credit	Grade Letter	Grade Point	Credit Point
Course-I	3	S	10	3x10=30
Course-II	3	A	9	3x9=27
Course-III	3	B	8	3x8=24
Course-IV	3	D	6	3x6=18
Course-V	2	B	8	2x8=16
Course-VI	1	C	7	1x7=7
	15			122

Thus,  $SGPA = \frac{122}{15} = 8.13$

##### Illustration for CGPA

I Semester	II Semester	III Semester	IV Semester
Credit: 20 SGPA: 8.13	Credit: 20 SGPA: 6.9	Credit: 20 SGPA: 7.3	Credit: 21 SGPA: 6.8
V Semester	VI Semester	VII Semester	VIII Semester
Credit: 20 SGPA: 8.2	Credit: 21 SGPA: 7.4	Credit: 19 SGPA: 7.2	Credit: 19 SGPA: 7.8

$$\text{Thus, CGPA} = \frac{(20 \times 8.13) + (20 \times 6.9) + (20 \times 7.3) + (21 \times 6.8) + (20 \times 8.2) + (21 \times 7.2) + (19 \times 7.2) + (19 \times 7.8)}{160}$$

$$= 7.461$$

## 14.0 AWARD OF CLASS

14.1 After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B.Tech. Degree he/she shall be placed in one of the following four CLASSES:

CGPA $\geq$ 7.5	CGPA $\geq$ 6.5 and < 7.5	CGPA $\geq$ 5.0 and < 6.5	CGPA $\geq$ 4.0 and < 5.0	CGPA < 4.0
<b>First Class with Distinction</b>	<b>First Class</b>	<b>Second Class</b>	<b>Pass Class</b>	<b>Fail</b>

A student with final CGPA is < 4.00 will not be eligible for the Award of the Degree.

## 15.0 CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

15.1 Semester end examination shall be conducted by the Controller of Examinations (COE) by inviting Question Papers from the External Examiners

15.2 Question papers may be moderated for the coverage of syllabus, pattern of questions by a Semester End Examination Committee chaired by CoE and senior subject expert before the commencement of semester end examinations. Internal Examiner shall prepare a detailed scheme of valuation.

15.3 The answer papers of semester end examination should be evaluated by the first examiner immediately after the completion of exam and the award sheet should be submitted to CoE in a sealed cover before the same papers are kept for second evaluation by external examiner.

15.4 In case of difference is more than 15% of marks, the answer paper shall be re-evaluated by a third examiner appointed by the Examination Committee and the marks awarded by third examiner is compared with first and second evaluation marks and higher marks of minimum difference pair will be considered as final marks.

15.5 CoE shall invite required number of external examiners to evaluate all the end-semester answer scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

15.6 Examinations Control Committee shall consolidate the marks awarded by both the examiners and award grades.

## 16.0 SUPPLEMENTARY EXAMINATIONS

Apart from the regular End Examinations the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day.

## 17.0 ATTENDANCE REQUIREMENTS AND DETENTION POLICY

17.1 A candidate shall put in a minimum required attendance of 75 % in that semester.

Otherwise, s/he shall be declared detained and has to repeat semester.

**17.2** For cases of medical issues, deficiency of attendance in a semester to the extent of 10% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the department if their attendance is between 75% and 65% in a semester, subjected to submission of medical certificates, medical case file and other needful documents to the concerned departments. The condonation is permitted maximum of two times during the entire course of study.

**17.3** A prescribed fee shall be payable towards condonation of shortage of attendance.

**17.4** A student shall not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he/she shall not be eligible for readmission into the same class.

**17.5** Any student against whom any disciplinary action by the institute is pending shall not be permitted to attend any SEE in that semester.

## **18.0 PROMOTION POLICIES**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 17.

**18.1** A student shall be promoted from IV Semester to V Semester only if he/she acquires 24 credits (i.e 40% of total credits) that have been studied up to III Semester from the following examinations, irrespective of whether the candidates takes the end examinations or not as per the normal course of the study

B.Tech I Semester - one Regular and two Supplementary

B.Tech II Semester - one Regular and one Supplementary

B.Tech III Semester - one Regular only

**18.2** A student shall be promoted from VI Semester to VII Semester only if he/she acquires 40 credits(i.e 40% of total credits) that have been studied up to V Semester from the following examinations, irrespective of whether the candidates takes the end examinations or not as per the normal course of the study

B.Tech I Semester - one Regular and four Supplementary

B.Tech II Semester - one Regular and three Supplementary

B.Tech III Semester - one Regular and two Supplementary

B.Tech IV Semester - one Regular and one Supplementary

B.Tech V Semester - one Regular only

**18.3** A student shall be promoted from VI Semester to VII Semester only if he/she acquires 24 of the credits (i.e 40% of the credits) from the courses that have been studied up to V Semester from all the regular and supplementary examinations until V Semester.

➤ Two regular and one supplementary examinations of III Semester.

➤ One regular and one supplementary examinations of IV Semester.

➤ One regular examination of V semester.

**18.4** A student shall register and put up minimum attendance in all 120 credits and earn all the 120 credits. Marks obtained in all 120 credits shall be considered for the

calculation of aggregate percentage of marks obtained.

- 18.5** Students who fail to earn 120 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission shall stand cancelled.

## **19.0 GRADUATION REQUIREMENTS**

The following academic requirements shall be met for the award of the B.Tech degree.

- 19.1** Student shall register and acquire minimum attendance in all courses and secure 160 credits for regular program and 120 credits for lateral entry program.
- 19.2** A student of a regular program, who fails to earn 160 credits within eight consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.
- 19.3** A student of a lateral entry program who fails to earn 120 credits within six consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

## **20.0 REVALUATION**

A student, who seeks the re-evaluation of the answer script, is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s), within 5 working days from the declaration of results in the prescribed format with prescribed fee to the Controller of Examinations through the Head of the department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for reevaluation. Based on the recommendations, the student can register for the reevaluation with prescribed fee. The Controller of Examinations shall arrange for the reevaluation and declare the results. Reevaluation is not permitted to the courses other than theory courses.

## **21.0 TEMPORARY BREAK OF STUDY FROM THE PROGRAMME**

- 21.1** A candidate is normally not permitted to break the study. However, if a candidate intends to temporarily discontinue the program in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the program after the break from the commencement of the respective semester as and when it is offered, s/he shall apply to the Principal in advance. Such application shall be submitted before the commencement of the semester in question and forwarded through the Head of the department stating the reasons for such withdrawal together with supporting documents and endorsement of his / her parent / guardian.
- 21.2** The institute shall examine such an application and if it finds the case to be genuine, it may permit the student to rejoin. Such permission is accorded only to those who do not have any outstanding dues like tuition fee etc.
- 21.3** The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in clause 19.0. The maximum period includes the break period.

## **22.0 TERMINATION FROM THE PROGRAMME**

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

- 22.1** The student fails to satisfy the requirements of the program within the maximum period

stipulated for that program.

**22.2** A student shall not be permitted to study any semester more than three times during the entire Program of study.

**22.3** The student fails to satisfy the norms of discipline specified by the institute from time to time.

### **23.0 WITH-HOLDING OF RESULTS**

If the candidate has any dues not paid to the institute or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld and he/she will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

### **24.0 STUDENT TRANSFERS**

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh from time to time.

### **25.0 GRADUATION DAY**

The institute shall have its own annual Graduation Day for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute. The college shall institute prizes and medals to meritorious students and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

### **26.0 CONDUCT AND DISCIPLINE**

➤ Students shall conduct themselves within and outside the premises of the Institute in a descent and dignified manner befitting the students of Audisankara College of Engineering & Technology.

➤ As per the order of the Honorable Supreme Court of India, ragging in any form is considered a criminal offence and is totally banned. Any form of ragging will be severely dealt with the following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

(i) Lack of courtesy and decorum; indecent behavior anywhere within or outside the college campus.

(ii) Damage of college property or distribution of alcoholic drinks or any kind of narcotics to fellow students / citizens.

➤ Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

➤ Mutilation or unauthorized possession of library books.

➤ Noisy and unruly behavior, disturbing studies of fellow students.

➤ Hacking in computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber crime etc.

➤ Usage of camera /cell phones in the campus.

➤ Plagiarism of any nature.

➤ Any other act of gross indiscipline as decided by the college academic council from time to time.

➤ Commensurate with the gravity of offense, the punishment may be reprimand,

fine, expulsion from the institute/ hostel, debarring from examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.

➤ For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief Warden, the concern Head of the Department and the Principal respectively, shall have the authority to reprimand or impose fine.

➤ Cases of adoption of unfair means and/ or any malpractice in an examination shall be reported to the principal for taking appropriate corrective action.

➤ All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the Academic council of the college.

➤ The Institute Level Standing Disciplinary Action Committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

➤ The Principal shall deal with any problem, which is not covered under these rules and regulations.

## **27.0 GRIEVANCE REDRESSAL COMMITTEE**

Grievance and Redressal Committee constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. All the students must abide by the code and conduct rules prescribed by the college from time to time.

## **28.0 TRANSITORY REGULATIONS**

required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semester(s) s/he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

### **28.1 Four Year B.Tech Regular course:**

A student who is following Jawaharlal Nehru Technological University Anantapur (JNTUA) curriculum and detained due to shortage of attendance at the end of the first semester shall join the autonomous batch of first semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUA curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses will be offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses

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

### **28.2 Three Year B.Tech program under Lateral Entry Scheme:**

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

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

### **28.3 Transfer candidates (from non-autonomous college affiliated to JNTUA):**

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

#### **28.4 Transfer candidates (from an autonomous college affiliated to JNTUA):**

A student who has secured the required credits upto previous semesters as per the regulations of other autonomous institutions shall also be permitted to be transferred to this institute. A student who is transferred from the other autonomous colleges to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of Studies. The total number of credits to be secured for the award of the degree will be the sum of the credits upto previous semester as per the regulations of the college from which he is transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

#### **29.0 REVISION OF REGULATIONS AND CURRICULUM**

The Institute from time to time may revise, amend or change the regulations, scheme of examinations and syllabi if found necessary and on approval by the Academic Council and the Governing Body shall come into force and shall be binding on the students, faculty, staff, all authorities of the Institute and others concerned.

**FAILURE TO READ AND UNDERSTAND  
THE REGULATIONS IS NOT AN EXCUSE**

## **B.TECH - PROGRAM OUTCOMES (POS)**

- PO-1** : Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems (**Engineering Knowledge**).
- PO-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**).
- PO-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**).
- PO-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**).
- PO-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**).
- PO-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**).
- PO-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**).
- PO-8** : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice (**Ethics**).
- PO-9** : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings (**Individual and Team Work**).
- PO-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**).
- PO-11** : Project management and finance: 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.
- PO-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**).

## **FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUT AUTONOMY**

### **1. Who grants Autonomy? UGC, Govt., AICTE or University**

In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy but only after concurrence from the respective state Government as well as UGC. The State Government has its own powers to grant autonomy directly to Govt. and Govt. aided Colleges.

### **2 Shall Audisankara College of Engineering & Technology award its own Degree?**

No. Degree will be awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu with a mention of the name Audisankara College of Engineering & Technology on the Degree Certificate.

### **3 What is the difference between a Deemed to be University and an Autonomy College?**

A Deemed to be University is fully autonomous to the extent of awarding its own Degree. A Deemed to be University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

### **4 How will the Foreign Universities or other stake – holders know that we are an Autonomous College?**

Autonomous status, once declared, shall be accepted by all the stake holders. The Govt. of Andhra Pradesh mentions autonomous status during the First Year admission procedure. Foreign Universities and Indian Industries will know our status through our website.

### **5 What is the change of Status for Students and Teachers if we become Autonomous?**

An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic performances, our capability of self- governance and the kind of quality education we offer.

### **6 Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?**

There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee, which will keep a watch on the academics and keep its reports and recommendations every year. In addition the highest academic council also supervises the academic matters. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

### **7 Will the students of Audisankara College of Engineering & Technology as an Autonomous College qualify for University Medals and Prizes for academic excellence?**

No. Audisankara College of Engineering & Technology has instituted its own awards, medals, etc. for

the academic performance of the students. However for all other events like sports, cultural on co-curricular organized by the University the students shall qualify.

**8 Can Audisankara College of Engineering & Technology have its own Convocation?**

No. Since the University awards the Degree the Convocation will be that of the University, but there will be Graduation Day at Audisankara College of Engineering & Technology.

**9 Can Audisankara College of Engineering & Technology give a provisional degree certificate?**

Since the examinations are conducted by Audisankara College of Engineering & Technology and the results are also declared Audisankara College of Engineering & Technology, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

**10 Will Academic Autonomy make a positive impact on the Placements or Employability?**

Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment. Also the autonomous status is more responsive to the needs of the industry. As a result therefore, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

**11 What is the proportion of Internal and External Assessment as an Autonomous College?**

Presently, it is 60 % external and 40% internal. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

**12 Is it possible to have complete Internal Assessment for Theory or Practicals?**

Yes indeed. We define our own system. We have the freedom to keep the proportion of external and internal assessment component to choose.

**13 Why Credit based Grade System?**

The credit based grade system is an accepted standard of academic performance the world over in all Universities. The acceptability of our graduates in the world market shall improve.

**14 What exactly is a Credit based Grade System?**

The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Learning process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like S,A+,A, B+,B,C,F etc. are assigned for a Range of Marks. (e.g. 90% and above is S, 80 to 89 % could be A+ etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance

**15 What are the norms for the number of Credits per Semester and total number of Credits for UG/PG programme?**

These norms are usually defined by UGC or AICTE. Usually around 28 Credits per semester is the accepted norm.

**16 What is a Semester Grade Point Average (SGPA)?**

The performance of a student in a semester is indicated by a number called SGPA. The SGPA is the weighted average of the grade points obtained in all the courses registered by the student during the semester.

$$SGPA = \frac{\sum_{i=1}^n (C_i G_i)}{\sum_{i=1}^n C_i}$$

Where,  $C_i$  is the number of credits of the  $i^{th}$  course and  $G_i$  is the grade point scored by the student in the  $i^{th}$  course and  $i$  represent the number of courses in which a student registered in the concerned semester. SGPA is rounded to two decimal places.

**17 What is a Cumulative Grade Point Average (CGPA)?**

An up-to-date assessment of overall performance of a student from the time of his first registration is obtained by calculating a number called CGPA, which is weighted average of the grade points obtained in all the courses registered by the students since he entered the Institute.

$$CGPA = \frac{\sum_{j=1}^m (C_j S_j)}{\sum_{j=1}^m C_j}$$

Where,  $S_j$  is the SGPA of the  $j^{th}$  semester and  $C_j$  is the total number of credits upto the semester and  $m$  represent the number of semesters completed in which a student registered upto the semester. CGPA is rounded to two decimal places.

**18 Is there any Software available for calculating Grade point averages and converting the same into Grades?**

Yes, the institute has its own MIS software for calculation of SGPA, CGPA, etc.

**19 Will the teacher be required to do the job of calculating SGPAs etc. and convert the same into Grades?**

No. The teacher has to give marks obtained out of whatever maximum marks as it is. Rest is all done by the computer.

**20 Will there be any Revaluation or Re-Examination System?**

No. There will double valuation of answer scripts. There will be a makeup Examination after a reasonable preparation time after the End Semester Examination for specific cases mentioned in the Rules and Regulations. In addition to this, there shall be a ‘summer term’ (compressed term) followed by the End Semester Exam, to save the precious time of students.

**21 How fast Syllabi can be and should be changed?**

Autonomy allows us the freedom to change the syllabi as often as we need.

**22 Will the Degree be awarded on the basis of only final year performance?**

No. The CGPA will reflect the average performance of all the semester taken together.

**23 What are Statutory Academic Bodies?**

Governing Body, Academic Council, Examination Committee and Board of Studies are the different statutory bodies. The participation of external members in every body is compulsory. The institute has nominated professors from IIT, NIT, University (the officers of the rank of Pro-vice Chancellor, Deans and Controller of Examinations) and also the reputed industrialist and industry experts on these bodies.

**24 Who takes Decisions on Academic matters?**

The Governing Body of institute is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like Boards of Studies. Decisions taken at the Board of Studies level are to be ratified at the Academic Council and Governing Body.

**25 What is the role of Examination committee?**

The Examinations Committee is responsible for the smooth conduct of internal, End Semester and makeup Examinations. All matters involving the conduct of examinations spot valuations, tabulations preparation of Grade Cards etc, fall within the duties of the Examination Committee.

**26 Is there any mechanism for Grievance Redressal?**

The institute has grievance redressal committee, headed by Dean - Student affairs and Dean - IQAC.

**27 How many attempts are permitted for obtaining a Degree?**

All such matters are defined in Rules & Regulation

**28 Who declares the result?**

The result declaration process is also defined. After tabulation work wherein the SGPA, CGPA and final Grades are ready, the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the Examinations and Result Committee for its approval. The result is then declared on the institute notice boards as well put on the web site and Students Corner. It is eventually sent to the University.

**29 Who will keep the Student Academic Records, University or Audisankara College of Engineering & Technology?**

It is the responsibility of the Dean, Academics of the Autonomous College to keep and preserve all the records.

**30 What is our relationship with the JNT University?**

We remain an affiliated college of the JNT University. The University has the right to nominate its members on the academic bodies of the college.

**31 Shall we require University approval if we want to start any New Courses?**

Yes, It is expected that approvals or such other matters from an autonomous college will receive priority.

**32 Shall we get autonomy for PG and Doctoral Programmes also?**

Yes, presently our PG programmes also enjoying autonomous status.

## MALPRACTICES RULES

### DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all 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 subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all 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 subject.
6.	Refuses to obey the orders of the Controller of Examinations /Additional 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 COE 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 COE 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 Institute premises or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all 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 subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.  Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	



**AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY  
(AUTONOMOUS)**

Gudur, Nellore Dist - 524101, A.P (India)

**B. Tech I Semester: Electrical and Electronics Engineering**

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	18MD101	Induction Training – 3 weeks (Mandatory Course)	-	-	-	-	-	-	-
2	18BS101	Mathematics-I	3	1	0	30	70	100	4
3	18BS105	Engineering Chemistry	3	0	0	30	70	100	3
4	18BS104	English	3	0	0	30	70	100	3
5	18ME102	Engineering Graphics	1	0	4	30	70	100	3
6	18CS101	Programming for Problem Solving	3	0	0	30	70	100	3
7	18BS108	Chemistry Lab	0	0	2	25	50	75	1
8	18BS109	English Lab	0	0	2	25	50	75	1
9	18CS102	Programming for Problem Solving Lab	0	0	4	25	50	75	2
<b>Total</b>			<b>13</b>	<b>1</b>	<b>12</b>	<b>225</b>	<b>500</b>	<b>725</b>	<b>20</b>

**B. Tech II Semester: Electrical and Electronics Engineering**

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	18BS201	Mathematics-II	3	1	0	30	70	100	4
2	18BS106	Engineering Physics	3	0	0	30	70	100	3
3	18ME103	Basic Mechanical and Civil Engineering	3	0	0	30	70	100	3
4	18EE201	Circuit Theory	3	0	0	30	70	100	3
5	18CS202	Data Structures	3	0	0	30	70	100	3
6	18BS107	Physics Lab	0	0	2	25	50	75	1
7	18ME104	Workshop Practice	0	0	2	25	50	75	1
8	18CS204	Data Structures Lab	0	0	4	25	50	75	2
<b>Total</b>			<b>15</b>	<b>1</b>	<b>8</b>	<b>225</b>	<b>500</b>	<b>725</b>	<b>20</b>

**B. Tech III Semester: Electrical and Electronics Engineering**

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	18BS301	Complex Analysis	3	1	0	30	70	100	3
2	18EC301	Electronic Devices and Circuits	3	0	0	30	70	100	3
3	18EE301	Network Theory	3	0	0	30	70	100	3
4	18EE302	Electromagnetic Fields	3	0	0	30	70	100	3
5	18EE303	Electrical Machines – I	3	0	0	30	70	100	3
6	18BS303	Managerial Economics and Financial Analysis	2	0	0	30	70	100	2
7	18EC306	Electronic Devices and Circuits Lab	0	0	2	25	50	75	1
8	18EE305	Electrical Circuits Lab	0	0	2	25	50	75	1
9	18EE306	Electrical Workshop Lab	0	0	2	25	50	75	1
<b>Non-Credit Courses</b>									
10	18AS301	Professional Society Activities-I	2	0	0	0	0	0	0
11	18AS302	Soft Skills Practice	0	0	2	0	0	0	0
12	18MD301	Environmental Sciences (Mandatory Course)	2	0	0	0	0	0	0
<b>Total</b>			<b>21</b>	<b>1</b>	<b>8</b>	<b>255</b>	<b>570</b>	<b>825</b>	<b>20</b>

**B. Tech IV Semester: Electrical and Electronics Engineering**

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	18ME302	Fluid Mechanics and Hydraulic Machinery	3	0	0	30	70	100	3
2	18EC406	Digital Electronics	3	0	0	30	70	100	3
3	18EE401	Electrical Machines – II	3	0	0	30	70	100	3
4	18EE402	Generation of Electrical Power	3	0	0	30	70	100	3
5	18EE403	Electrical Measurements and Instrumentation	3	0	0	30	70	100	3
6	18ME306	Management Science	2	0	0	30	70	100	2
7	18ME308	Fluid Mechanics and Hydraulic Machinery Lab	0	0	2	25	50	75	1
8	18EE404	Electrical Machines Lab - I	0	0	2	25	50	75	1
9	18EE405	Measurements and Instrumentation Lab	0	0	2	25	50	75	1
10	18EE406	Technical Seminar	0	2	0	50	-	50	1
<b>Non-Credit Courses</b>									
11	18AS401	Professional Society Activities-II	2	0	0	0	0	0	0
12	18AS402	Communication Skills Practice	0	0	2	0	0	0	0
<b>Total</b>			<b>19</b>	<b>3</b>	<b>8</b>	<b>305</b>	<b>570</b>	<b>875</b>	<b>21</b>

**B. Tech V Semester: Electrical and Electronics Engineering**

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	18EC509	Analog Electronics	3	0	0	30	70	100	3
2	18EE501	Power Electronics	3	1	0	30	70	100	3
3	18EE502	Transmission and Distribution of Electrical Power	3	0	0	30	70	100	3
4	18EE503	Control Systems	3	0	0	30	70	100	3
5	18EE504	Electrical Machines-III	3	0	0	30	70	100	3
6	<b>Open Elective-I</b>		2	0	0	30	70	100	2
7	18EC514	Analog Electronics Lab	0	0	2	25	50	75	1
8	18EE508	Electrical Machines Lab-II	0	0	2	25	50	75	1
9	18EE509	Control Systems Lab	0	0	2	25	50	75	1
<b>Non-Credit Courses</b>									
10	18AS501	Professional Society Activities-III	2	0	0	0	0	0	0
11	18AS502	Quantitative Aptitude	2	0	0	0	0	0	0
12	18MD501	Indian Constitution (Mandatory Course)	2	0	0	0	0	0	0
<b>Total</b>			<b>23</b>	<b>1</b>	<b>6</b>	<b>255</b>	<b>570</b>	<b>825</b>	<b>20</b>

**B. Tech VI Semester: Electrical and Electronics Engineering**

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	18EC303	Signals and Systems	3	0	0	30	70	100	3
2	18EC505	Microprocessors and Microcontrollers	3	0	0	30	70	100	3
3	18EE601	Power System Analysis	3	1	0	30	70	100	3
4	18EE602	Power Semiconductor Drives	3	0	0	30	70	100	3
<b>Elective-I</b>									
5	18EE603	High Voltage Engineering	3	0	0	30	70	100	3
	18EE604	Electrical Energy Conservation and Auditing							
	18EE605	Computer Architecture							
	18EE606	Available MOOCs/ 12 week NPTEL courses suggested by the department							
6	<b>Open Elective-II</b>		2	0	0	30	70	100	2
7	18EC513	Microprocessors and Microcontrollers Lab	0	0	2	25	50	75	1
8	18EE610	Simulation of Electrical Systems Lab	0	0	2	25	50	75	1
9	18EE611	Power Electronics Lab	0	0	2	25	50	75	1
10	18EE612	Term Paper	0	2	0	50	-	50	1
<b>Non-Credit Courses</b>									
11	18AS601	Professional Society Activities-IV	2	0	0	0	0	0	0
12	18AS602	Technical Aptitude	2	0	0	0	0	0	0
<b>Total</b>			<b>21</b>	<b>3</b>	<b>8</b>	<b>305</b>	<b>570</b>	<b>875</b>	<b>21</b>

**B. Tech VII Semester: Electrical and Electronics Engineering**

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	18EE701	Power System Protection	3	1	0	30	70	100	3
2	18EE702	Power System Operation and Control	3	0	0	30	70	100	3
3	<b>Open Elective-III</b>		2	0	0	30	70	100	2
<b>Elective-II</b>									
4	18EC715	Embedded Systems	3	0	0	30	70	100	3
	18EE706	Utilization of Electrical Energy							
	18EE707	PLCS and SCADA							
	18EE708	Available MOOCs							
<b>Elective-III</b>									
5	18EC716	Digital Signal Processing	3	0	0	30	70	100	3
	18EE709	Wind and Solar Energy Systems							
	18EE710	Flexible AC transmission Systems							
	18EE711	Available MOOCs/ 12 week NPTEL courses suggested by the department							
6	18EE712	Power Electronics and Drives Lab	0	0	2	25	50	75	1
7	18EE713	Power Systems Lab	0	0	2	25	50	75	1
8	18EE714	Project Work Phase-I	0	0	4	50	50	100	2
9	18EE715	Comprehensive Assessment	0	0	2	100	-	100	1
<b>Non-Credit Course</b>									
10	18MD701	Essence of Indian Traditional Knowledge (Mandatory Course)	2	0	0	0	0	0	0
<b>Total</b>			<b>16</b>	<b>1</b>	<b>10</b>	<b>350</b>	<b>500</b>	<b>850</b>	<b>19</b>

**B. Tech VIII Semester: Electrical and Electronics Engineering**

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
<b>Elective-IV</b>									
1	18EE801	Advanced Electrical Drives	3	1	0	30	70	100	3
	18EE802	HVDC Transmission Systems							
	18EE803	Industrial Electrical Systems							
	18EE804	Available MOOCs							
<b>Elective-V</b>									
2	18EE805	Digital Control Systems	3	0	0	30	70	100	3
	18EE806	Smart Grid							
	18EE807	Power System Reliability							
	18EE808	Available MOOCs							
<b>Elective-VI</b>									
3	18EC813	VLSI Design	3	0	0	30	70	100	3
	18EE809	Electrical Materials							
	18EE810	Power Plant Engineering							
	18EE811	Available MOOCs/ 12 week NPTEL courses suggested by the department							
4	18EE812	Project Work Phase-II	0	0	20	60	140	200	10
<b>Total</b>			<b>9</b>	<b>1</b>	<b>20</b>	<b>150</b>	<b>350</b>	<b>500</b>	<b>19</b>

**B. Tech VIII Semester: Electrical and Electronics Engineering (FSI)**

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	CIA	SEE	Total	
1	18EE814	Full Semester Internship	0	0	40	200	300	500	19

**OPEN ELECTIVE – I**

<b>S. No</b>	<b>Course Code</b>	<b>Course Title</b>
1.	18CE506	Disaster Management
2.	18CE507	Global Information System
3.	18CE508	Green Buildings and Energy Conservations
4.	18EE505	Power Quality
5.	18EE506	Energy Auditing and Demand Side Management
6.	18EE507	Power Plant Engineering
7.	18ME506	Additive Manufacturing
8.	18ME507	Gas Dynamics and Jet Propulsion
9.	18ME508	Hydraulics and Pneumatics Systems
10.	18EC506	Principles of Modern Communication Systems
11.	18EC507	Nano Electronics
12.	18EC508	Micro Controller Applications
13.	18CS505	OOPs through Java
14.	18CS506	Advanced Data Structures
15.	18CS507	Webpage Design

**OPEN ELECTIVE – II**

<b>S. No</b>	<b>Course Code</b>	<b>Course Title</b>
1.	18CE609	Industrial Waste Water Engineering
2.	18CE610	Impact of Climate Change in Water Resource
3.	18CE611	Research Methodology
4.	18EE607	Neural Networks and Fuzzy Logic
5.	18EE608	Electrical Materials
6.	18EE609	Illumination Engineering
7.	18ME609	Energy Conversion Management
8.	18ME610	Six Sigma
9.	18ME611	Total Quality Management
10.	18EC609	Biomedical Electronics
11.	18EC610	Consumer Electronics
12.	18EC611	Display Systems
13.	18CS601	Python Programming
14.	18CS609	Fundamentals of Artificial Intelligence
15.	18CS610	Software Engineering

**OPEN ELECTIVE-III**

<b>S. No</b>	<b>Course Code</b>	<b>Course Title</b>
1.	18CE703	Project Safety Management
2.	18CE704	Global Warming And Climate Change
3.	18CE705	Human Ethics and Values
4.	18EE703	Industrial Automation and Control
5.	18EE704	Energy Conservation
6.	18EE705	Optimization Techniques
7.	18ME703	Smart Materials

8.	18ME704	Micro- Electromechanical Systems [MEMS]
9.	18ME705	Advanced Internal Combustion Engines.
10.	18EC703	Fundamentals Of Image Processing
11.	18EC704	Biomedical Instrumentation
12.	18EC705	Fundamentals Of Embedded Systems
13.	18EC706	Wavelets
14.	18CS703	R Programming
15.	18CS704	Machine Learning
16.	18CS705	Data Warehousing And Data Mining

## MATHEMATICS-I

<b>B. Tech I Semester: Common to CE, ME, EEE, ECE &amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18BS101</b>	<b>H&amp;S</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		3	1	0	4	30	70	100
<b>Contact Classes:75</b>		<b>Tutorial Classes: 5</b>		<b>Practical Classes:-</b>		<b>Total Classes: 80</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
1. Finding maxima and minima of function of two and three variables.								
2. Methods of solving the differential equations of first and higher order.								
3. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.								
4. Methods of finding solutions for integral and differential equations with initial conditions.								
<b>UNIT-I</b>	<b>PARTIAL DIFFERENTIATION AND APPLICATIONS</b>					<b>CLASSES:15</b>		
Partial differentiation; Total derivative; Jacobian; Functional dependence and independence, Taylor's theorem & Machlaurin's theorem (without proof) for function of two variables; Maxima and Minima of functions of two and three variables-method of Lagrange's method of undetermined multipliers.								
<b>UNIT-II</b>	<b>ORDINARY DIFFERENTIAL EQUATIONS</b>					<b>CLASSES:15</b>		
Exact- Integrating factors, Linear and Bernoulli's equations; Applications: Newton's law of cooling, Law of natural growth and decay. Second and higher order linear differential equations with constant coefficients: Non-homogeneous terms of the type $e^{ax}$ , $\sin ax$ , $\cos ax$ , polynomial in $x$ , $e^{ax}v(x)$ and $xv(x)$ ; Method of variation of parameters.								
<b>UNIT-III</b>	<b>MATRICES</b>					<b>CLASSES:15</b>		
Matrices: Types of Matrices-Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, Orthogonal & Unitary Matrices (Definitions only); Rank of a matrix by Echelon form and Normal form, solutions of system of linear equations.								
<b>UNIT-IV</b>	<b>EIGENVALUES AND EIGENVECTORS</b>					<b>CLASSES:15</b>		
Eigenvalues and Eigenvectors and their properties: Cayley-Hamilton theorem (without proof); Finding the inverse and power of a matrix using Cayley-Hamilton theorem.								
<b>UNIT-V</b>	<b>LAPLACE TRANSFORMS</b>					<b>CLASSES:15</b>		
Laplace transforms of elementary functions – Properties - Transforms of derivatives, integrals–Unit step function-Dirac delta function- Periodic function. Inverse laplace transforms by Partial fractions – Properties - Convolution theorem – Application of laplace transforms to ordinary differential equations of first and second order with initial conditions.								
<b>Text Books:</b>								
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.								
2. T.K.V. Iyengar, B. Krishna Gandhi and Others, Engineering Mathematics (Vol – I & II) –S. Chand & Company.								
<b>Reference Books:</b>								
1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.								
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill.								

**Web References:**

1. [www.mathplanet.com](http://www.mathplanet.com)
2. [www.mathworld.com](http://www.mathworld.com)

**E-Text Books:**

1. Baidyanath Patra –“An Introduction to Integral Transforms”.
2. W W L Chen-“Multivariable and Vector Analysis”.

**Outcomes:**

At the end of the course students able to

1. Expand various algebraic, trigonometric and hyperbolic functions in Fourier series in different intervals
2. Solve various boundary value problems using Fourier transforms
3. Evaluate the multiple integrals and apply the concept to find areas and volumes
4. Evaluate the line, surface and volume integrals and converting them from one form to another

## ENGINEERING CHEMISTRY

<b>B. Tech I Semester: Common to EEE &amp; ECE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18BS105	H&S	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: 5</b>	<b>Practical Classes:-</b>			<b>Total Classes: 65</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.								
2. To impart the basic knowledge of atomic, molecular and electronic modifications which makes the students to understand the technology based on them.								
3. To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.								
4. To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways.								
<b>UNIT-I</b>	<b>MOLECULAR STRUCTURE AND THEORIES OF BONDING:</b>						<b>CLASSES:15</b>	
Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N <sub>2</sub> , O <sub>2</sub> and F <sub>2</sub> molecules. $\pi$ molecular orbitals of butadiene, benzene and Aromaticity. Crystal Field Theory (CFT): Salient features of CFT – The energy level diagrams for transition metal ions with respect to Tetrahedral, Octahedral and square planar geometries.								
<b>UNIT-II</b>	<b>ELECTROCHEMISTRY AND CORROSION SCIENCE</b>						<b>CLASSES:15</b>	
Theories of Electrolytes, Conductance, Equivalent conductance, Molecular conductance, application of conductance, Conductometric Titration –acid vs. base. Electrochemical cell: single and Standard electrode potential. Battery Technology: Ni-Cad cell, Lithium Cells, Fuel Cells, Hydrogen – Oxygen fuel cell, Methanol-oxygen fuel. Corrosion-definition, examples, effects- Mechanism of Dry and wet corrosion. Factor Influencing corrosion, corrosion control methods-sacrificial anode, impressed current, Cathodic Protective Coatings: - Metal Coatings; Hot dipping, Metal Cladding, Cementation.								
<b>UNIT-III</b>	<b>WATER TECHNOLOGY</b>						<b>CLASSES:15</b>	
<b>Water Technology-I:</b> Sources and impurities of water, Hardness of Water, Units Of Hardness, Estimation of Hardness, Dissolved oxygen, Alkalinity and chlorides, Boiler troubles –Scales, sludge's, caustic embrittlement and boiler corrosion-causes, disadvantages and prevention, internal conditioning methods-phosphate, calgon and sodium aluminate-External treatment methods- ion-exchange methods process . <b>Water Technology-II:</b> water treatment for drinking purpose-disinfection and concept of break point chlorination –Desalination of brackish water-Principle and Process of electro-dialysis and reverse osmosis.								
<b>UNIT-IV</b>	<b>STEREOCHEMISTRY</b>						<b>CLASSES:12</b>	
Introduction to representation of 3-dimensional structures, structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and absolute configuration.								
<b>UNIT-V</b>	<b>REACTION MECHANISM</b>						<b>CLASSES:15</b>	

Substitution reaction: Nucleophilic substitution reactions: Mechanism of  $S_N1$ ,  $S_N2$  reactions. Electrophilic and nucleophilic addition reactions: Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds.

**Text Books:**

1. Engineering Chemistry by P.C. Jain & M.Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. University Chemistry, by B.M. Mahan, Pearson IV Edition
3. Engineering Chemistry (NPTEL Web – book), by B.L. Tembe, Kamaluddin and M.S. Krishnan
4. Advanced Physical Chemistry by Gurdepraj
5. Essential Physical chemistry by B.S.Bhal & Arun Bhal and J.D.Tuli , S.Chand Company
6. Organic Spectroscopy by Jag Mohan
7. Engineering chemistry by Sashichawala

**Reference Books:**

1. Physical Chemistry, by P.W. Atkins
2. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5th Edition.
3. Organic chemistry by Jerry March

**Web References:**

1. [www.physicalchemistry.com](http://www.physicalchemistry.com)
2. <https://en.wikiboos.org>

**E-Text Books:**

1. Engineering chemistry. Jp Publications.
2. Engineering chemistry. Jain & Jain publications.

**Outcomes:**

At the end of the course students able to

1. The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
2. The required skills to get clear concepts on water treatment methods.
3. The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
4. The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

## ENGLISH

<b>B. Tech I Semester: Common to CE, ME, CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18BS104	H&S	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes:</b>	<b>Practical Classes:-</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.								
2. Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.								
3. Develop study skills and communication skills in formal and informal situations.								
4. Acquire fundamental and functional knowledge of English language, grammar and communication skills.								
<b>UNIT-I</b>	<b>“THE ROAD NOT TAKEN”, “WHERE THE MIND IS WITHOUT FEAR”</b>						<b>CLASSES:15</b>	
Introduction of the Poets, Background information of the poems, Literary terms, Setting of the poems, Question and answers.								
<b>UNIT-II</b>	<b>“THE EYES ARE NOT HERE”, “THE EYES ARE NOT HERE”</b>						<b>CLASSES:15</b>	
Introduction of the authors, Character analysis of the stories, Background information, Literary terms, Question and answers.								
<b>UNIT-III</b>	<b>“THE OPEN WINDOW” , “THE LOST CHILD”</b>						<b>CLASSES:15</b>	
Introduction of the authors, Character analysis of the stories, Background information, Literary terms, Question and answers.								
<b>UNIT-IV</b>	<b>“THE ROMANCE OF A BUSY BROKER” , REPORT WRITING</b>						<b>CLASSES:15</b>	
Introduction of the author, Character analysis of the story, Background information, Literary terms, Question and answers.... Types of reports, Formats of Reports & Parts of a Formal report.								
<b>UNIT-V</b>	<b>“FORMAL LETTERS” , GRAMMAR</b>						<b>CLASSES:15</b>	
Format of Formal letters, Different styles, Exercises of Complaint Letters and Exercises of English Grammar.								
<b>Text Books:</b>								
1. Vibrant English, Orient BlackSwan.								
<b>Reference Books:</b>								
1. Swan, M. (2016). Practical English Usage. Oxford University Press.								
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxfore University Press.								
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.								
4. Oxford Dictionary of Thesaurus , Third edition.								

**Web References:**

1. [www.grammarbook.com](http://www.grammarbook.com)
2. [www.grammarbytes.com](http://www.grammarbytes.com)
3. [https://en.wikipedia.org/wiki/Category:Short\\_story\\_collections\\_by\\_R.\\_K.\\_Narayan](https://en.wikipedia.org/wiki/Category:Short_story_collections_by_R._K._Narayan)

**E-Text Books:**

1. Fundamentals of English Grammar
2. Oxford English Grammar Course

**Outcomes:**

At the end of the course students able to

1. Use English Language effectively that demonstrates an understanding of the basic components of grammar.
2. Comprehend and explain different phrases in prose and poetry and respond appropriately.
3. Learned the technique of presenting stories with perplexing twist endings
4. Acquire basic proficiency in English, writing official letters including Job Applications and Technical Reports.
5. Apply ethical principles and learn to commit to professional ethics.
6. Inculcated an attitude of evaluating the right path in their lives through varied experiences of eminent people.

## ENGINEERING GRAPHICS

<b>B. Tech I Semester: Common to CE, ME, EEE, ECE &amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18ME102</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		1	-	4	3	30	70	100
<b>Contact Classes: 12</b>		<b>Tutorial Classes:</b>		<b>Practical Classes: 48</b>		<b>Total Classes: 60</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
<ol style="list-style-type: none"> <li>1. Convey visual perception information regarding relative locations of objects through an orthographic/isometric view.</li> <li>2. Analyze a drawing and bring out any inconsistencies to put forth inferences graphically.</li> <li>3. Create feasible designs of simple objects with drawing tools and/or free-hand.</li> <li>4. Get training in the transformation of the imagined data to present as drawings so that the communication skill will be increased especially in technical subjects.</li> </ol>								
<b>UNIT-I</b>	<b>INTRODUCTION TO ENGINEERING DRAWING</b>						<b>CLASSES:12</b>	
Lettering-Geometrical Constructions-Construction of Polygons. <b>Conic Sections</b> -Ellipse-Parabola-Hyperbola-general methods and a rectangular hyperbola								
<b>UNIT-II</b>	<b>PROJECTIONS OF POINTS, STRAIGHT LINES</b>						<b>CLASSES:12</b>	
<b>Points:</b> Introduction to Orthographic Projections, Describing of quadrants, First and Third angle projection – Position of points in four quadrants. <b>Straight Lines:</b> Lines parallel to both the principal planes, perpendicular to one plane and parallel to another plane, lines inclined to one plane, lines inclined to both the planes.								
<b>UNIT-III</b>	<b>PROJECTION OF PLANES</b>						<b>CLASSES:12</b>	
Projection of regular plane surfaces, planes parallel to one plane, plane perpendicular to one plane , planes inclined to one plane and inclined to both the planes.								
<b>UNIT-IV</b>	<b>PROJECTION OF SOLIDS</b>						<b>CLASSES:12</b>	
Positions of regular solids( prism, cylinder, pyramid,and cone) – Projection of Solids – Axis parallel to both the Principal planes, Axis perpendicular to one plane and parallel to another plane, Axis inclined to one plane, inclined to both the planes.								
<b>UNIT-V</b>	<b>ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS</b>						<b>CLASSES:12</b>	
Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines.								
<b>Text Books:</b>								
<ol style="list-style-type: none"> <li>1.N.D. Bhat, Engineering Drawing, Charotar Publishers, 52nd Revised and Enlarged: 2013</li> <li>2. K.L. Narayana, P. Kanniah, Engineering Drawing, Publisher, Scitech</li> </ol>								
<b>Reference Books:</b>								
<ol style="list-style-type: none"> <li>1. Venugopal, K., A Textbook of Engineering Graphics, New age Publishers,2009</li> <li>2. Venkata Reddy, Engineering Drawing, B.S.Publishers, 2009</li> <li>3. Basant Agrawal, C M Agrawal ,Engineering Drawing, 2013</li> <li>4. V.RameshBabu, Engineering Drawing .2009</li> </ol>								

**Web References:**

1. <https://nptel.ac.in/courses/112103019/>
2. <http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html>

**E-Text Books:**

1. [http://web.iitd.ac.in/~achawla/public\\_html/201/lectures/sp46.pdf](http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf)
2. [https://books.google.co.in/books/about/Engineering\\_Drawing.html?id=\\_hdOU8kRb2AC](https://books.google.co.in/books/about/Engineering_Drawing.html?id=_hdOU8kRb2AC)

**Outcomes:**

At the end of the course students able to

1. Impart the training in multi-view representations and its conversion into pictorial views and the reverse also
2. Ability to understand the different standards in technical drawing and to help in reaching future engineering positions especially in research and design
3. To get a clear idea about isometric projection

## PROGRAMMING FOR PROBLEM SOLVING

<b>B. Tech I Semester: Common to CE, ME, EEE, ECE &amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18CS101	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: -</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
1. Provide exposure to problem-solving through programming.								
2. Train the student to the basic concepts of the C-programming language.								
3. Design programs involving decision structures, loops for problem solving								
4. Learn string handling and string manipulation operations								
5. Know about derived data types like structures and unions.								
6. To learn problem solving techniques.								
<b>UNIT-I</b>	<b>INTRODUCTION TO COMPUTERS AND C</b>						<b>CLASSES:12</b>	
<b>Introduction to Computers:</b> Definition of a Computer, Block diagram of a Computer, Types of Programming Languages, Algorithms, Flow-charts.								
<b>Introduction to C:</b> History of C, General form of a C Program, C-Tokens, Data types, Operators and Expressions, Formatted Input and Output.								
<b>UNIT-II</b>	<b>DECISION MAKING, LOOPING AND JUMP STATEMENTS</b>						<b>CLASSES:12</b>	
<b>Decision Making – Branching:</b> if, if-else, Nested if, Ladder if and switch statement.								
<b>Looping:</b> While statement, do-while statement, for statement.								
<b>Jump Statements:</b> break, continue, goto.								
<b>UNIT-III</b>	<b>ARRAYS AND FUNCTIONS</b>						<b>CLASSES:12</b>	
<b>Arrays:</b> Introduction, Declaration, Initialization and Accessing of 1-Dimensional and 2-dimensional arrays.								
<b>Functions:</b> Introduction, Categories of a function, Recursive functions, Storage CLASSES: auto, extern, static and register.								
<b>UNIT-IV</b>	<b>POINTERS AND STRINGS</b>						<b>CLASSES:12</b>	
<b>Pointers:</b> Definition, Declaration, initialization & accessing of a pointer variable, Pointers to Pointers, Array of Pointers, Parameter Passing methods.								
<b>Strings:</b> Declaring and initializing String variables, String handling functions.								
<b>UNIT-V</b>	<b>STRUCTURES, UNIONS AND FILES</b>						<b>CLASSES:12</b>	
<b>Structures and Unions:</b> Introduction, Declaration and Initialization of Structure, Structure within Structure, Array of Structures, Pointer to Structure, Union.								
<b>Files:</b> Introduction, Basic operations of files.								
<b>Text Books:</b>								
1. E. Balagurusamy, “Programming with ANSI-C”, Fourth Edition,2008, Tata McGraw Hill.								
2. Byron S Gottfried “Programming with C” Second edition, Tata McGrawhill, 2007								
3. ISRD Group, “Programming and Problem Solving Using C”, Tata McGraw Hill, 2008.								
<b>Reference Books:</b>								
1. R.G. Dromey, “How to solve it by Computer”, Pearson Education, 2008.								
2. Kanetkar Y, “Let us C”, BPB Publications, 2007.								

3. Hanly J R &Koffman E.B, “Problem Solving and Programm design in C”, PearsonEducation, 2009.

**Web References:**

1. <https://www.toptal.com/c/the-ultimate-list-of-resources-to-learn-c-and-c-plus-plus>
2. <https://hackr.io/tutorials/learn-c>

**Outcomes:**

**At the end of the course students able to**

1. Understand the fundamentals of C programming.
2. Read, understand and trace the execution of programs written in C language.
3. Choose the loops and decision-making statements to solve the problem.
4. Implement different Operations on arrays.
5. Use functions to solve the given problem.
6. Understand pointers, structures and unions.
7. Implement file Operations in C programming for a given application.

## CHEMISTRY LAB

<b>B.Tech I Semester: Common to CE, ME, EEE, ECE &amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18BS108	H&S	L	T	P	C	CIA	SEE	TOTAL
		0	0	2	1	25	50	75
<b>Contact Classes:60</b>	<b>Tutorial Classes:</b>	<b>Practical Classes:</b>			<b>Total Classes: 30</b>			
<b>Nil</b>								
<b>OBJECTIVES:</b>								
1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose.								
2. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.								
<b>EXPERIMENT1</b>	Determination of total hardness of water by complexometric method using EDTA						<b>CLASSES:03</b>	
To estimate various hardness such as temporary, permanent and total hardness etc.								
<b>EXPERIMENT2</b>	Determination of dissolved oxygen in the given water samples by using Winkler's method						<b>CLASSES:03</b>	
To estimate dissolved oxygen in various water samples using iodo-metric method.								
<b>EXPERIMENT3</b>	Determination of alkalinity of water in the given water samples						<b>CLASSES:03</b>	
To estimate various alkalinity in the given water sample.								
<b>EXPERIMENT4</b>	Determination of chloride content of water by Argentometry						<b>CLASSES:03</b>	
To estimate presence of chlorine in the given various water samples.								
<b>EXPERIMENT5</b>	Estimation of the strength of HCl by Conductometry titrations						<b>CLASSES:03</b>	
To determine the strength of strong acid by using conductometric titration methods								
<b>EXPERIMENT6</b>	Estimation of Acetic acid by Conductometric titrations						<b>CLASSES:03</b>	
To determine the strength of weak acid by using conductometric titration methods.								
<b>EXPERIMENT7</b>	Determination of surface tension of a given liquid using stalagmometer						<b>CLASSES:03</b>	
To determine the surface tension of given liquid samples using stalagmometer								
<b>EXPERIMENT8</b>	Determination of partition coefficient of acetic acid between n-butanol and water.						<b>CLASSES:03</b>	
To determine the partition coefficient of acetic acid between n-butanol and water.								
<b>EXPERIMENT9</b>	Thin layer chromatography calculation of R <sub>f</sub> values. Eg ortho and para nitro phenols						<b>CLASSES:03</b>	
To determine the R <sub>f</sub> value of the following compounds								
<b>EXPERIMENT10</b>	Synthesis of Aspirin						<b>CLASSES:03</b>	
To prepare the aspirin compound in the laboratory.								
<b>Reference Books:</b>								
1. Text book on Experiments and calculations in Engineering Chemistry – S.S Dara								
2. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg ( R. Chand &Co., Delhi)								
<b>Web References:</b>								
1. <a href="http://www2.chem.uic.edu">www2.chem.uic.edu</a>								
2. <a href="https://people.ok.ubc.ca/">https://people.ok.ubc.ca/</a>								

3. <http://www.elsevier.com/books/experiments>.

**E-Text Books:**

1. A Text book of Physical chemistry by Puri, Sharma, Pathania, Kaur.
2. Conceptual Physical chemistry by prabhat kumar.

**Outcomes:**

At the end of the course students able to

1. Determination of parameters like hardness and chloride content in water.
2. Calculation of  $R_f$  values of some organic molecules by TLC technique

## ENGLISH LAB

<b>B.Tech I Semester: Common to CE, ME, EEE, ECE &amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18BS109	H&S	L	T	P	C	CIA	SEE	TOTAL
		0	0	3	1	25	50	75
<b>Contact Classes:60</b>	<b>Tutorial Classes:</b>	<b>Practical Classes:</b>			<b>Total Classes: 36</b>			
<b>Nil</b>								
<b>OBJECTIVES:</b>								
1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.								
2. To sensitize students to the nuances of English speech sounds, word accent and intonation.								
3. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.								
4. To improve the fluency of the students in spoken English and neutralize their mother tongue influence.								
<b>ACTIVITY-I</b>	Introduction to Phonetics, Vowels, Diphthongs and Consonants.					<b>CLASSES:15</b>		
Introduction of the sounds, Vowels, Consonants, Place of Articulation and Manner of Articulation								
<b>ACTIVITY-II</b>	Stress & Intonation					<b>CLASSES:03</b>		
Stress, Primary Stress, Secondary Stress, Syllable, Falling Tone, Rising Tone, Falling-Rising Tone								
<b>ACTIVITY-III</b>	Just a Minute (JAM)					<b>CLASSES:06</b>		
Explanation of Impromptu speech, Rules to be followed, Dos and Don'ts.								
<b>ACTIVITY-IV</b>	Situational Dialogues					<b>CLASSES:06</b>		
Explanation of different types of Dialogues, Dos and Don'ts								
<b>ACTIVITY-V</b>	Group Discussion					<b>CLASSES:06</b>		
Explanation of various Group Discussions, Dos and Don'ts								
<b>Reference Books:</b>								
1. Daniel Jones, English Pronouncing Dictionary, Current Edition with CD.								
2. R.K.Bansal and J. B. Harrison, Spoken English, Orient Longman 2006 Edn.								
3. Krishna Mohan & NP Singh, Speaking English Effectively (Macmillan)								
4. Meenakshi Raman & Sangeeta Sharma, Technical Communication, Oxford University Press 2009.								
5. K R Lakshminarayan and T. Murugavel, Managing Soft Skills, Sci-Tech Publication, 2010.								
<b>Web References:</b>								
1. <a href="http://www.grammarbook.com">www.grammarbook.com</a>								
2. <a href="http://www.grammarbytes.com">www.grammarbytes.com</a>								
<b>E-Text Books:</b>								
1. A Complete Kit for Group Discussion								
2. English Conversation Practice								
<b>Outcomes:</b>								
At the end of the course students able to								
1. Better understanding of nuances of English language through audio-visual experience and group activities.								

2. Neutralization of accent for intelligibility.
3. Speaking skills with clarity and confidence which in turn enhances their employability skills.

## PROGRAMMING FOR PROBLEM SOLVING LAB

### **B. Tech I Semester: Common to CE, ME, EEE, ECE & CSE**

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
18CS102	Core	L	T	P	C	CIA	SEE	Total
		-	-	4	2	25	50	75
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: 45</b>			<b>Total Classes: 45</b>			

#### **OBJECTIVES:**

**The course should enable the students to:**

1. To develop primary programming skills upto the higher end in order solve the different programming logics...
2. To write different type of logics at the end of the sessions. After learning the C course, the student can able get all the fundamental knowledge in all the languages.
3. To Understand the student can able to attend any MNC Company interview and can solve the technical rounds both theoretically and Practically
4. To Provide lot of logical examples to make as good as.

#### **LIST OF EXPERIMENTS**

<b>EXPT. 1</b>	<b>EXPRESSIONS</b>
Programs on Expressions.	
<b>EXPT. 2</b>	<b>OPERATORS</b>
Programs on Operators.	
<b>EXPT. 3</b>	<b>DECISION CONTROL STATEMENTS</b>
Programs on decision control statements.	
<b>EXPT. 4</b>	<b>LOOP STATEMENTS</b>
Programs on loop statements.	
<b>EXPT. 5</b>	<b>NESTED LOOPS</b>
Programs on Nested Loops.	
<b>EXPT. 6</b>	<b>ARRAYS</b>
Programs using arrays.	
<b>EXPT.7</b>	<b>FUNCTIONS</b>
Programs to implement on functions.	
<b>EXPT. 8</b>	<b>RECURSION</b>
Programs using recursion.	
<b>EXPT. 9</b>	<b>STRING HANDLING FUNCTIONS</b>
Programs to implement string handling functions.	

<b>EXPT. 10</b>	<b>POINTERS</b>
Programs to implement on pointers.	
<b>EXPT. 11</b>	<b>STRUCTURES</b>
Programs to implement on structures.	
<b>EXPT. 12</b>	<b>FILES</b>
Programs on files.	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. E. Balagurusamy, "Programming with ANSI-C", Fourth Edition, 2008, Tata McGraw Hill.</li> <li>2. Byron S Gottfried "Programming with C" Second edition, Tata McGrawhill, 2007</li> <li>3. ISRD Group, "Programming and Problem Solving Using C", Tata McGraw Hill, 2008..</li> </ol>	
<b>Course Home Page:</b>	
<b>SOFTWARE AND HARDWARE REQUIREMENTS FOR STUDENTS:</b>	
<b>SOFTWARE:</b> Dev C++, Turbo C	
<b>HARDWARE:</b> Desktop Computers	
<b>Course Outcome:</b>	
At the end of the course, a student will be able to:	
<ol style="list-style-type: none"> <li>1. To Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.</li> <li>2. To Use of conditional expressions and looping statements and to solve problems associated with conditions and repetitions.</li> <li>3. To Know the Functions involving the idea of modularity.</li> </ol>	

## MATHEMATICS-II

<b>B.Tech II Semester: Common to CE, ME, EEE, ECE &amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18BS201	H&S	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	4	30	70	100
<b>Contact Classes:75</b>		<b>Tutorial Classes: 5</b>		<b>Practical Classes: Nil</b>		<b>Total Classes: 80</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
1. Expansion of various functions as Fourier series and Fourier transforms								
2. Evaluation of multiple integrals and their applications								
3. Physical quantities involved in engineering field related to vector valued functions								
4. The basic properties of vector valued functions and their applications to line, surface and volume integrals								
<b>UNIT-I</b>	<b>FOURIER SERIES</b>						<b>CLASSES:10</b>	
Euler formulae (without proof) – Expansion of functions as a Fourier series –Change of interval – Even and odd functions – Half range series – Complex form of Fourier series.								
<b>UNIT-II</b>	<b>FOURIER TRANSFORMATIONS</b>						<b>CLASSES:12</b>	
Fourier integral theorem (without proof) – Fourier transformations – Properties - Sine and Cosine transformations - Inverse fourier transformations – Convolution – Parseval’s identity.								
<b>UNIT-III</b>	<b>Z-TRANSFORMATIONS</b>						<b>CLASSES:13</b>	
Z – Transforms of elementary functions – Properties – Shifting theorems– Initial and Final value theorems - Inverse Z – transforms by convolution and partial fractions – Applications to first and second order difference equations.								
<b>UNIT-IV</b>	<b>MULTIPLE INTEGRALS</b>						<b>CLASSES:20</b>	
Evaluation of double integrals (cartesian and polar coordinates); change of order of integration (only cartesian form); Evaluation of triple integrals: Change of variables for double (cartesian to polar) and triple integrals (cartesian to spherical and cylindrical polar coordinates).								
<b>UNIT-V</b>	<b>VECTOR CALCULUS</b>						<b>CLASSES:20</b>	
Vector differentiation: Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Scalar potential functions. Solenoidal and Irrotational vectors. Vector integration: Line, Surface and Volume integrals. Theorems of Green’s, Gauss’s and Stoke’s (without proofs) and their applications.								
<b>Text Books:</b>								
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.								
2. T.K.V. Iyengar, B. Krishna Gandhi and Others, Engineering Mathematics (Vol – I & II) –S. Chand & Company.								
<b>Reference Books:</b>								
1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.								
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill.								
<b>Web References:</b>								
1. <a href="http://www.mathplanet.com">www.mathplanet.com</a>								
2. <a href="http://www.mathworld.com">www.mathworld.com</a>								

**E-Text Books:**

1. Baidyanath Patra-“An introduction to integral transforms”.
2. Michael Corral –“**Vector Calculus**”.

**Outcomes:**

At the end of the course students able to

1. Find the extreme values of functions of two variables with/without constraints.\
2. Solve higher differential equation and apply the concept of differential equation to real world problems.
3. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
4. Solutions for integral and differential equations with initial conditions by Laplace transforms.

## ENGINEERING PHYSICS

<b>B.Tech II Semester: Common to EEE &amp; ECE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18BS106</b>	<b>H&amp;S</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>		<b>Tutorial Classes: 5</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 65</b>	
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
1. Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques.								
2. Students will be able to demonstrate competency and understanding of the concepts found in Quantum Mechanics, Fiber optics and lasers, Semiconductor physics and a broad base of knowledge in physics.								
3. The graduates will be able to solve non-traditional problems that potentially draw on knowledge in multiple areas of physics.								
4. To study applications in engineering like memory devices, transformer								
<b>UNIT-I</b>	<b>WAVE OPTICS AND FIBER OPTICS</b>					<b>CLASSES:18</b>		
<b>Interference:</b> Huygens's principle, Superposition principle, Interference in thin film, Newton's rings and its applications								
<b>Diffraction:</b> Types of Diffraction, Fraunhofer diffraction due to a single slit, Diffraction grating. <b>Fiber Optics:</b> Introduction, Optical fiber as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Types of Optical fibers: Step and Graded index fibers, Applications of optical fibers.								
<b>UNIT-II</b>	<b>ELECTROMAGNETIC THEORY</b>					<b>CLASSES:15</b>		
Explanation and physical significance of divergence and curl, electric polarizations and displacements, dielectric sphere in uniform electric field, explanation and physical significance of scalar and vector fields, ferro, para and dia magnetic materials, displacement current, Maxwell's equations and significance.								
<b>UNIT-III</b>	<b>QUANTUM MECHANICS</b>					<b>CLASSES:15</b>		
Introduction to quantum physics, Wave-particle duality, de-Broglie's hypothesis, Davisson and Germer experiment, Matter Waves, Heisenberg's Uncertainty principle, Schrodinger's time independent wave equation, Physical Significance of Wave function, Particle in one dimensional box.								
<b>UNIT-IV</b>	<b>SEMICONDUCTORS</b>					<b>CLASSES:12</b>		
<b>Semiconductors:</b> Introduction, Origin of bands, Classification of metals based on band gap, Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on temperature, Drift and Diffusion, Einstein relation, Hall effect.								
<b>UNIT-V</b>	<b>LASERS AND NANOPHYSICS</b>					<b>CLASSES:15</b>		
<b>Lasers:</b> Characteristics of Laser, Principle of Laser, Population Inversion, Pumping Mechanism, Types of Lasers: Ruby laser, He-Ne laser, Applications of laser.								
<b>Nanophysics:</b> Basic principles of nanomaterials, Synthesis of nanomaterials: Ball milling, Sol-Gel methods, Properties of nanomaterials: physical, optical, thermal, and magnetic properties, Applications of nanomaterials.								
<b>Text Books:</b>								
1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learning.								

2. K.Thyagarajan, Engineering Physics ,McGraw Hill Education 2015
3. Dr.S.L.Guptha,Jaiprakash nath publications-Meerut
4. D.J.Griffiths-Introduction to electrodynamics

**Reference Books:**

1. Richard Robinett, Quantum Mechanics
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
3. Engineering Physics .S.Chand&Company Pvt.Ltd

**Web References:**

- 1 [www.physics.org.com](http://www.physics.org.com)
- 2 <https://en.wikiboos.org>

**E-Text Books:**

1. quantum mechanics- **Weng cho chew**
2. Electromagnetism – **Iggy Megoven**
3. Physics of atomic and moleculs –prof K Heyne

**Outcomes:**

At the end of the course students able to

1. The student would be able to learn the fundamental concepts on Quantum behavior of matter in its micro state.
2. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications

## BASICS MECHANICAL AND CIVIL ENGINEERING

<b>B.Tech II Semester: Common to EEE, ECE &amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18ME103	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: - Nil</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
<p><b>The course should enable the students to :</b></p> <p>I. Gain knowledge on force systems and their applications</p> <p>II. Understand the fundamental concepts of civil engineering</p> <p>III. Understand the fundamental concepts of mechanical engineering</p>								
<b>UNIT-I</b>	<b>INTRODUCTION TO CIVIL ENGINEERING</b>						<b>CLASSES:12</b>	
<p><b>General Introduction to Civil Engineering</b> - Various disciplines of Civil engineering, Relevance of Civil engineering in the overall infrastructural development of the country. Introduction to types of buildings as per NBC; Selection of site for buildings. Components of a residential building and their functions. Introduction to industrial buildings – office / factory / software development office / power house /electronic equipment service centre (any one related to the branch of study).</p> <p><b>Note:</b> Students have to visit one such building and submit an assignment about the features of any one of the listed building related to their branch (Not included for exam). Building materials - Bricks, cement blocks - Properties and specifications. Cement – OPC, properties, grades; other types of cement and its uses (in brief).Cement mortar – constituents, preparation. Concrete – PCC and RCC – grades. Steel - Use of steel in building construction, types and market forms.</p>								
<b>UNIT-II</b>	<b>SURVEYING</b>						<b>CLASSES:12</b>	
<p><b>Surveying</b> - Principles and objectives of surveying; Horizontal measurements – instruments used – tape, types of tapes; Ranging (direct ranging only) – instruments used for ranging. Leveling - Definitions, principles, Instruments (brief discussion only) -Level field book - Reduction of levels - problems on leveling (height of collimation only).</p>								
<b>UNIT-III</b>	<b>MODERN SURVEYING INSTRUMENTS</b>						<b>CLASSES:12</b>	
<p><b>Modern surveying instruments</b> – Electronic distance meter, digital level, total station, GPS (Brief discussion only).</p> <p><b>Basics of Engineering Mechanics:</b> Basic Concepts of Engineering Mechanics: Characteristics of a force – various types of force systems – Resultant – Composition and resolution of forces –Principles of moments of force – Couples.</p>								
<b>UNIT-IV</b>	<b>RESULTANT OF FORCE SYSTEM</b>						<b>CLASSES:12</b>	
<p><b>Resultants of Force System:</b> Resultants of different types of force systems.</p> <p><b>Equilibrium of Forces:</b> Free body diagrams – Equations of equilibrium for different force systems</p> <p><b>Moment of Inertia:</b> Definition – Parallel Axis Theorem and Perpendicular Axis Theorem — Radius of Gyration – Moment of Inertia of simple areas</p>								
<b>UNIT-V</b>	<b>SIMPLE STRESS AND STRAINS</b>						<b>CLASSES:12</b>	
<p><b>Simple Stresses And Strains:</b> Concept of stress and strain, stress and strain diagram for mild steel, Elasticity and plasticity – Types of stresses and strains – Hooke’s law– Factor of safety- Poisson’s ratio and volumetric strain – Elastic moduli and the relationship between them.</p>								
<b>Text Books:</b>								
1. A Textbook of Engineering Mechanics,3rd Edition, Bhavikatti S S , New Age International, 2016								

2. Engineering Mechanics, Dr. R. K. Bansal, 4th Edition, Laxmi Publications, 2011
3. S.S.BHAVIKATTI, Basic Civil Engineering, New age international publishers
4. Rangwala, Essentials of Civil Engineering, Charotar Publishing House.

**Reference Books:**

1. Engineering Mechanics, D.S. Kumar, 3rd Edition, S.K. KATARIA & SONS
2. Singer's Engineering Mechanics: Statics and Dynamics, 3rd Edition, K. Vijaya Kumar Reddy, J. Suresh Kumar, B.S. Publications, 2011.
3. Anurag A. Kandyia, Elements of Civil Engineering, Charotar Publishing house

**Web References:**

1. [ronney.usc.edu/AME101/AME101-LectureNotes.pdf](https://ronney.usc.edu/AME101/AME101-LectureNotes.pdf)
2. <https://nptel.ac.in/courses/122104015/>

**E-Text Books:**

1. <https://books.google.co.in/books?isbn=9339224760>
2. <https://books.google.co.in/books?isbn=8125908374>
3. <https://books.google.co.in/books?isbn=8126518782>

**Outcomes:**

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

1. Determine the effect of force and motion in course of carrying out the design functions of engineering
2. Identify structures and properties of different materials
3. Illustrate the uses of various building materials
4. Explain the method of construction of different components of a building
5. Understand the concept of surveying and its application
6. Understand the concept of simple stresses and strains

## CIRCUIT THEORY

<b>B.Tech II Semester: Electrical &amp; Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE201	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: 0</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
1.To provide a methodical approach to problem solving. 2. To learn a number of powerful engineering circuit analysis techniques such as nodal analysis, mesh analysis, theorems, source transformation and several methods of simplifying networks. 3. To understand the concept of graphical solution to electrical network 4. To understand frequency response in electrical circuits 5. To develop a clear understanding of the important parameters of a magnetic circuit. 6. To analyze various types of filters and attenuators. 7. Different types of two-port network analysis using network parameters, with different types of connections.								
<b>UNIT-I</b>	<b>ELECTRIC CIRCUITS&amp; SINGLE PHASE AC CIRCUITS</b>					<b>CLASSES:12</b>		
<b>Electric Circuits:</b> Review of basics of Electrical circuits and Star-Delta Transformations, Source Transformations, Kirchhoff's laws, Mesh and Super mesh analysis. Node and super node analysis, power & energy calculations. <b>Single Phase AC Circuits:</b> Review of AC circuits, Phasor representation of alternating quantities-Mathematical representation of Phasors-Behavior of pure resistor, Inductor and capacitor in ac circuits. Series RL circuit, RC circuit and RLC circuit – Parallel AC circuits - , instantaneous power, average power, calculation of average power for periodic non-sinusoidal wave forms. Complex Power, Comparison of. Power Terminology.								
<b>UNIT-II</b>	<b>NETWORK THEOREMS (APPLICATION TO DC &amp; AC NETWORKS)</b>					<b>CLASSES:12</b>		
<b>Network Theorems (Application To DC &amp; AC Networks):</b> Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Tellegen's theorem and Compensation Theorem.								
<b>UNIT-III</b>	<b>SERIES AND PARALLEL RESONANCE</b>					<b>CLASSES:12</b>		
<b>Series and Parallel Resonance:</b> Series Resonance, Impedance and Phase angle of a Series Resonant circuit, Voltages and Currents in a Series Resonant circuit, Bandwidth of an RLC circuit, The Quality factor (Q) and its effect on Bandwidth, Magnification in Series Resonance. Parallel Resonance, Resonant frequency for a tank circuit, Variation of Impedance with frequency, Q factor of Parallel Resonance, Magnification in Parallel Resonance, Reactance curves in Parallel Resonance.								
<b>UNIT-IV</b>	<b>COUPLED CIRCUITS</b>					<b>CLASSES:12</b>		
<b>Coupled Circuits:</b> Introduction, Conductively coupled circuits and mutual Impedance, Mutual Inductance, Dot convention, Coefficient of Coupling, Ideal Transformer, Series connection of coupled Inductors, Parallel connection of coupled coils.								
<b>UNIT-V</b>	<b>NETWORK TOPOLOGY</b>					<b>CLASSES:12</b>		
<b>Network Topology:</b> Graph of a Network, Definitions associated with graph, formation of incidence matrix, loop matrix and cut - set matrices. Relationship between Branch Voltage Matrix, Twig Voltage matrix and Node voltage matrix. Relationship between branch current Matrix and Loop current matrix, Duality.								
<b>Text Books:</b>								

1. Ravish R Singh, "Network Analysis and Synthesis", Tata McGraw Hill, 1st edition, 2011.
2. A. Sudhakar and Shyam Mohan S. Palli, "Circuits & Networks Analysis and Synthesis", 3rd ed., Tata McGraw-Hill, New Delhi, 2007

**Reference Books:**

1. W.H. Hayt, J.E. Kemmerly and S.M. Durbin, Engineering Circuit Analysis, 8<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi, 2012
2. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 5th Edition, McGraw-Hill, 2012.

**Web References:**

1. <https://www.researchgate.net>
2. <https://www.aar.faculty.asu.edu/CLASSES>
3. <https://www.facstaff.bucknell.edu/>
4. <https://www.electrical4u.com>

**E-Text Books:**

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

**Outcomes:**

1. Analyze DC circuits using different methods.
2. Analyze AC circuits and apply appropriate Network theorem for solving Electric Circuits
3. Understand series and parallel resonance concepts and analyze coupled circuits.
4. Understand magnetically coupled circuits
5. Formulate network matrices using network topology and understand the concept of duality.

## DATA STRUCTURES

<b>B. Tech II Semester: Common to EEE, ECE&amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18CS202	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
<ol style="list-style-type: none"> <li>1. Demonstrate familiarity with major algorithms and data structures.</li> <li>2. Choose the appropriate data structure and algorithm design method for a specified application.</li> <li>3. Determine which algorithm or data structure to use in different scenarios.</li> <li>4. To improve the logical ability.</li> </ol>								
<b>UNIT-I</b>	<b>INTRODUCTION TO ALGORITHMS AND DATA STRUCTURES</b>						<b>CLASSES:12</b>	
<b>Algorithms:</b> Definition, Properties, Performance Analysis-Space Complexity, Time Complexity, Asymptotic Notations. <b>Data structures:</b> Introduction, Data Structures types, Data Structure Operations.								
<b>UNIT-II</b>	<b>STACKS AND QUEUES</b>						<b>CLASSES:12</b>	
<b>Stacks:</b> Introduction, Stack Operations, Applications: Infix to Postfix Conversion, Evaluation of Postfix Expression. <b>Queues:</b> Introduction, Operations on queues, Circular queues, Priority queues.								
<b>UNIT-III</b>	<b>LINKED LISTS AND APPLICATIONS</b>						<b>CLASSES:12</b>	
<b>Linked lists:</b> Introduction, Singly linked lists, Circular linked lists, Doubly linked lists, Multiply linked lists, Applications: Polynomial Representation. Implementation of Stack and Queue using linked list.								
<b>UNIT-IV</b>	<b>SORTING AND SEARCHING</b>						<b>CLASSES:12</b>	
<b>Sorting:</b> Introduction, Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, HeapSort. <b>Searching:</b> Introduction, Linear search, Binary search, Fibonacci search.								
<b>UNIT-V</b>	<b>TREES AND BINARY TREES</b>						<b>CLASSES:12</b>	
<b>Trees:</b> Introduction, Definition and basic terminologies, Representation of trees. <b>Binary Trees:</b> Basic Terminologies and Types, Binary Tree Traversals, Binary Search Trees.								
<b>Text Books:</b>								
<ol style="list-style-type: none"> <li>1. G.A.V PAI, Data Structures and Algorithms, Concepts, Techniques and Applications, Volume1, 1stEdition, Tata McGraw-Hill, 2008.</li> <li>2. Richard F. Gilberg&amp; Behrouz A. Forouzan, Data Structures, Pseudo code Approach with C, 2ndEdition, Cengage Learning India Edition, 2007.</li> </ol>								
<b>Reference Books:</b>								
<ol style="list-style-type: none"> <li>1. Langsam,M. J. Augenstein, A. M. Tanenbaum, Datastructures using C and C++, 2nd Edition, PHI Education, 2008.</li> <li>2. Sartaj Sahni, Ellis Horowitz, Fundamentals of at Structures in C, 2nd Edition, Orientblackswan, 2010.</li> </ol>								
<b>Web References:</b>								
<ol style="list-style-type: none"> <li>1. <a href="https://www.geeksforgeeks.org/data-structures/">https://www.geeksforgeeks.org/data-structures/</a></li> </ol>								

2. <https://www.programiz.com/dsa>
3. <https://www.w3schools.in/data-structures-tutorial/intro/>

**Outcomes:**

**At the end of the course students able to**

1. Apply Concepts of Stacks, Queues, Linked Lists.
2. Develop Programs for Searching and Sorting, Trees.
3. Interpret concepts of trees.
4. Develop programs for Sorting and Searching.

## PHYSICS LAB

<b>B.Tech II Semester: Common to CE, ME, EEE, ECE &amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18BS107	H&S	L	T	P	C	CIA	SEE	TOTAL
		0	0	2	1	25	50	75
<b>Contact Classes:30</b>	<b>Tutorial Classes:</b>	<b>Practical Classes:</b> <b>Nil</b>			<b>Total Classes: 30</b>			
<b>COURSE OBJECTIVES</b>								
1. To make the students gain practical knowledge to co-relate with the theoretical studies 2. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability 3. To develop and fabricate engineering and technical equipments.								
<b>EXPERMENT1</b>	To determine the frequency of a vibrating bar or turning fork using Melde's arrangement						<b>CLASSES:03</b>	
<b>EXPERMENT2</b>	To determine the rigidity modulus of the material of the given wire using torsional pendulum						<b>CLASSES:03</b>	
<b>EXPERMENT3</b>	To determine the radius of curvature of the lens by forming Newton's rings.						<b>CLASSES:03</b>	
<b>EXPERMENT4</b>	To determine the wavelength of laser light.						<b>CLASSES:03</b>	
<b>EXPERMENT5</b>	To determine the dispersive power of prism by using spectrometer						<b>CLASSES:03</b>	
<b>EXPERMENT6</b>	To determine quality factor and resonant frequency of LCR circuit.						<b>CLASSES:03</b>	
<b>EXPERMENT7</b>	Determine particle size by using laser sources						<b>CLASSES:03</b>	
<b>EXPERMENT8</b>	To determine the Numerical aperture of a given fiber						<b>CLASSES:03</b>	
<b>EXPERMENT9</b>	Determination of magnetic field along axis of a current carrying coil.						<b>CLASSES:03</b>	
<b>EXPERMENT10</b>	To determine the time constant of R-C circuit						<b>CLASSES:03</b>	
<b>Any eight experiments may be performed in a semester</b>								
<b>Reference Books:</b>								
1. Manual cum Record for Engineering Physics Lab-1&2, by Prof. Sri M. Rama Rao, Acme Learning. 2. Physics lab Manual-Department of H&S, ASCET (Autonomous)								
<b>Web References:</b>								
1. <a href="http://www.physics.org.com">www.physics.org.com</a> 2. <a href="https://en.wikiboos.org">https://en.wikiboos.org</a>								
<b>E-Text Books:</b>								
1. Classical mechanics by <b>Radovan dermi</b> 2. Physics of atomic and molecuels-prof K Heyne								

**Outcomes:**

At the end of the course students able to

1. Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations
2. Develop procedures and observational skills as data is taken and gain a fundamental understanding of simple and complex apparatus used in the experiment.

## WORKSHOP PRACTICE

<b>B.Tech II Semester: Common to CE, ME, EEE, ECE &amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18ME104</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		-	-	3	1	30	70	100
<b>Contact Classes: Nil</b>		<b>Tutorial Classes: - Nil</b>			<b>Practical Classes: 54</b>		<b>Total Classes: 54</b>	
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
I. To familiarize with the basic manufacturing processes and to study the various tools and equipment used, hands-on training is given in different sections.								
II. Essentially student should know the labor involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work.								
<b>LIST OF EXPERIMENTS</b>								
<b>Expt. 1</b>	<b>CARPENTRY SHOP</b>							
1 Cross Lap Joint 2 Mortise and Tenon Joint								
<b>Expt. 2</b>	<b>FITTING SHOP</b>							
1 Square Fitting 2 V- Fitting								
<b>Expt. 3</b>	<b>SHEET METAL SHOP</b>							
1 3-Sided Tray (Trapezoidal Tray) 2 Cylinder (Circular Tin)								
<b>Expt. 4</b>	<b>HOUSE WIRING</b>							
1 Wiring for two lamps (bulbs) with independent switch controls with or without looping 2 Wiring for stair case lamp								
<b>Expt. 5</b>	<b>FOUNDRY</b>							
1 Single Piece Pattern 2 Double Piece Pattern								
<b>Expt. 6</b>	<b>WELDING</b>							
1 Lap Joint 2 T – Joint								
<b>Expt.7</b>	<b>TRADES FOR DEMONSTRATION</b>							
1 Machine Shop (Lathe Machine, Grinding Machine and Drilling Machine) 2 Metal Cutting 3 Plumbing								

**Reference Books:**

1. Engineering Work shop practice, V. Ramesh Babu, VRB Publishers Private Limited, 2009
2. Work shop Manual, P.Kannaiah and K.L.Narayana, SciTech Publishers, 2009

**Web References:**

1. Engineering workshop Lab manual, Department of Mechanical Engineering, GMRIT Rajam
2. Workshop Practice Manual, K. Venkata Reddy, BS Publications

**Course Outcome:**

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

1. Utilize workshop tools for engineering practice
2. Analyze and find out suitable method of fabrication of a given simple component.
3. Employ skills acquired to provide quick fixes for routine domestic and/or industrial problems.
4. Appreciate the hard work and intuitive knowledge of the manual workers.

## DATA STRUCTURES LAB

<b>B. Tech II Semester: Common to EEE, ECE &amp; CSE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>18CS204</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		-	-	4	2	25	50	75
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: Nil</b>		<b>Practical Classes: 45</b>			<b>Total Classes: 45</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
1. To develop skills to design and analyze simple linear and nonlinear data structures								
2. To Strengthen the ability to identify and apply the suitable data structure for the given real-world problem								
3. To Gain knowledge in practical applications of data structures								
4. To make the student write ADTS for all data structures.								
<b>LIST OF EXPERIMENTS</b>								
<b>EXPT. 1</b>	<b>STACK</b>							
Write C program to implement the stack using arrays.								
<b>EXPT. 2</b>	<b>QUEUE</b>							
Write C program to implement the Queue using arrays.								
<b>EXPT. 3</b>	<b>POSTFIX EVALUATION</b>							
Write C program to Evaluation a postfix expression.								
<b>EXPT. 4</b>	<b>SINGLY LINKED LIST</b>							
Write C program to implement the Singly linked list.								
<b>EXPT. 5</b>	<b>BUBBLE SORT</b>							
Write C programs to implement Bubble Sort Algorithm.								
<b>EXPT. 6</b>	<b>SELECTION SORT</b>							
Write C programs Selection Sort Algorithm.								
<b>EXPT.7</b>	<b>INSERTION SORT</b>							
Write C programs to implement Insertion Sort Algorithm.								
<b>EXPT. 8</b>	<b>MERGE SORT</b>							
Write C programs to implement Merge Sort Algorithm.								
<b>EXPT. 9</b>	<b>QUICK SORT</b>							
Write C programs to implement Quick Sort Algorithm.								
<b>EXPT. 10</b>	<b>LINEAR SEARCH</b>							
Write C programs to implement Linear Search Algorithm.								
<b>EXPT. 11</b>	<b>BINARY SEARCH</b>							
Write C programs to implement Binary Search Algorithm.								
<b>EXPT. 12</b>	<b>BINARY TREE</b>							

Write a C program to implement binary tree using Arrays.

#### **Reference Books:**

1. G.A.V PAI, Data Structures and Algorithms, Concepts, Techniques and Applications, Volume1, 1stEdition, Tata McGraw-Hill, 2008.
2. Richard F. Gilberg& Behrouz A. Forouzan, Data Structures, Pseudo code Approach with C, 2ndEdition, Cengage Learning India Edition, 2007.
3. Langsam,M. J. Augenstein, A. M. Tanenbaum, Datastructures using C and C++, 2nd Edition, PHI Education, 2008.
4. Sartaj Sahni, Ellis Horowitz, Fundamentals of at Structures in C, 2nd Edition, Orientblackswan, 2010.

#### **Course Home Page:**

#### **SOFTWARE AND HARDWARE REQUIREMENTS FOR STUDENTS:**

**SOFTWARE:** Dev C++, Turbo C

**HARDWARE:** Desktop Computers

#### **Course Outcome:**

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

1. Implement Stacks and Queues Using Arrays.
2. Develop Programs for Searching and Sorting Algorithms
3. Develop Programs Using Concepts of Trees.
4. Choose appropriate data structure as applied to specified problem definition.

## COMPLEX ANALYSIS

<b>B.Tech III Semester: Common to EEE &amp; ECE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18BS301	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	30	70	100
<b>Contact Classes: 50</b>	<b>Tutorial Classes: 10</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
I. understand the concept of improper integrals through Gamma and Beta functions								
II. understand the differentiation and Integration with reference to complex variables								
III. evaluate definite integrals involving complex variables in a simpler means by applying the integral theorem of complex variables								
IV. expand the functions in power series and compute residues								
V. understand the conformal mappings and their importance in Engineering domain								
<b>UNIT-I</b>	<b>SPECIAL FUNCTIONS</b>						<b>CLASSES: 20</b>	
Gamma and Beta functions – their properties – Evaluation of Improper integrals. Bessel functions – properties – Recurrence relations – Orthogonality. Legendre polynomials – Properties – Rodrigue’s formula – Recurrence Relations – Orthogonality.								
<b>UNIT-II</b>	<b>FUNCTIONS OF A COMPLEX VARIABLES</b>						<b>CLASSES: 10</b>	
Functions of a complex variable – Definition of continuity – Differentiability – Analyticity – Properties – Cauchy – Riemann equations in cartesian and polar co-ordinates. Harmonic and Conjugate Harmonic function – Milne – Thomson method.								
<b>UNIT-III</b>	<b>COMPLEX INTEGRATION &amp; COMPLEX POWER SERIES</b>						<b>CLASSES: 10</b>	
Complex Integration: Line integral – Evaluation along a path and by indefinite integration – Cauchy’s integral theorem – Cauchy’s integral formula. Complex Power series: Radius of convergence – Taylor’s and Laurent’s series.								
<b>UNIT-IV</b>	<b>CALCULUS OF RESIDUES</b>						<b>CLASSES: 10</b>	
Singular and Isolated singular points – poles of order ‘m’ – Essential singularity (definitions only) Evaluation of residues – Residue theorem – Evaluation of integrals of the type Improper real integral (a) $\int_{-\alpha}^{\alpha} f(x)dx$ , (b) $\int_0^{2\pi} f(\cos \theta, \sin \theta)d\theta$ , (c) $\int_{-\alpha}^{\alpha} e^{imx} f(x)dx$ .								
<b>UNIT-V</b>	<b>CONFORMAL MAPPING</b>						<b>CLASSES: 10</b>	
Basic transformations-translation, rotation, magnification and inversion – Bilinear transformations – Fixed points – Cross ratio – Determination of bilinear Transformation mapping three given points – Conformal Mapping – Special transformations $e^z$ , $z^2$ , $\sin z$ , $\cos z$ .								
<b>Text Books:</b>								
1. B. S. Grewal , Higher Engineering Mathematics, Khanna Publications.								
2. T.K.V. Iyengar, B. Krishna Gandhi and Others , Engineering Mathematics (Vol – III) -S. Chand & Company								
<b>Reference Books:</b>								
1. J. W. Brown & R. V. Churchill , Complex Variables and Applications -McGraw Hill Education								
2. B.V. Ramana , A Text Book of Engineering Mathematics- Tata McGraw Hill Publications								
3. Complex Variables – 2nd Edition - Schaum Outline Series - McGraw Hill Companies								
4. R.K Jain & S.R.K Iyengar , Advanced Engineering Mathematics – NarosaBook distributors pvt ltd								
<b>Web References:</b>								
1. <a href="http://mathworld.wolfram.com/CauchyIntegralTheorem.html">http://mathworld.wolfram.com/CauchyIntegralTheorem.html</a>								

2. <http://freeusermanuals.com/backend/web/manuals/1519124893conjugate%20harmonic.pdf>

**E-Text Books:**

1. <http://web.math.ku.dk/noter/filer/koman-12.pdf>

2. <http://www.maths.lth.se/matematiklu/personal/olofsson/CompHT06.pdf>

**Outcomes:**

1. solve the improper integrals using Beta and Gamma functions

2. apply the concept of C - R equations to solve problems on complex differentiation related to potential functions using Milne – Thompson Method

3. solve the problems on Complex Integration

4. solve problems on Laurent series – Residue theorem which is applicable in signal processing and communications

5. solve problems on bilinear transformation which is useful to convert analog transfer functions into digital transfer functions for digital system design in digital signal processing.

## ELECTRONIC DEVICES AND CIRCUITS

B.TechIII Semester: Common to ECE & EEE								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EC301	Core	L	T	P	C	CIA	SEE	TOTAL
		3	-	-	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
I. Know the formation and properties of semiconductor materials & Understand the operation of diode								
II. Understand various types of rectifiers and Understand the importance of regulators								
III. Explain the operation of transistor and Know the need for biasing of transistor & Explain the operation of transistor as amplifier								
<b>UNIT-I</b>	<b>JUNCTION DIODE CHARACTERISTICS</b>						<b>CLASSES:20</b>	
Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.								
<b>Special Semiconductor Diodes:</b> Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel Diode, DIAC, TRIAC, SCR, UJT. Construction, operation and characteristics of all the diodes is required to be considered.								
<b>UNIT-II</b>	<b>RECTIFIERS AND FILTERS</b>						<b>CLASSES:10</b>	
Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, L- section filter, P- section filter, Multiple L- section and Multiple P section filter, comparison of various filter circuits in terms of ripple factors.								
<b>UNIT-III</b>	<b>BJT</b>						<b>CLASSES:10</b>	
Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.								
<b>FET:</b> FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.								
<b>UNIT-IV</b>	<b>TRANSISTOR BIASING AND THERMAL STABILIZATION</b>						<b>CLASSES:10</b>	
Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in $V_{BE}$ , $I_c$ , and $\beta$ , Stability factors, ( $S$ , $S'$ , $S''$ ), Bias compensation, Thermal runaway, Thermal stability. FET Biasing- methods and stabilization.								
<b>UNIT-V</b>	<b>BJT</b>						<b>CLASSES:10</b>	
Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.								
<b>FET Amplifiers:</b> Small Signal Model, Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers. MOSFET Characteristics in Enhancement and Depletion mode, Basic Concepts of MOS Amplifiers								
<b>Text Books:</b>								
1. J. Millman, C. Halkias, "Electronic Devices and Circuits", Tata Mc-Graw Hill, Second Edition, 2010								
2. David A. Bell, "Electronic Devices and Circuits", Fifth Edition, Oxford University Press, 2009								
3. Salivahanan, Kumar, Vallavaraj, "Electronic Devices and Circuits", Tata Mc-Graw Hill, Second								

Edition

**Reference Books:**

1. Jacob Millman, C. Halkies, C.D.Parikh, “Integrated Electronics”, Tata Mc-Graw Hill,2009
2. R.L. Boylestad and Louis Nashelsky,“Electronic Devices and Circuits”,Pearson Publications, 9<sup>th</sup>Edition,2006

**Web References:**

- 1.<http://www.circuitstoday.com/understanding-the-pn-junction>
- 2.<https://www.elprocus.com/difference-between-bjt-and-fet/>
3. <http://www.rfwireless-world.com/Terminology/CB-vs-CE-vs-CC-transistor-configurations.html>

**E-Text Books:**

- 1.<https://archive.org/details/ElectronicDevicesCircuits>
- 2.<https://www.scribd.com/doc/281044230/EDC-BAKSHI-pdf>

**Outcomes:**

1. Explain the properties of semiconductor materials in the formation of PN
2. Classify the V-I characteristics of CB, CE &CC configurations.
3. Design various biasing circuits to achieve the required stability in transistor amplifiers
4. Illustrate the operation of FETs and special diodes for different applications
5. Design half wave, full wave rectifiers with and without filters for different applications
6. Explain the BJT and FET amplifiers.

## NETWORK THEORY

<b>B.Tech III Semester: Electrical &amp; Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE301	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>		<b>Tutorial Classes: 0</b>		<b>Practical Classes: Nil</b>		<b>Total Classes: 60</b>		
<b>OBJECTIVES:</b>								
1. To analyze behavior of basic circuit elements and to apply concept of mesh and node analysis in circuit theory. 2. Apply various network theorems to determine the circuit response / behavior. 3. To apply transformation of a network to analyze time domain , differential eq. 4. To study necessary conditions for driving point functions , transfer function for their application to a given network for analyzing circuit design.								
<b>UNIT-I</b>	<b>TRANSIENT ANALYSIS</b>						<b>CLASSES:12</b>	
<b>Differential equation approach:</b> Steady state and transient response, source free, DC and sinusoidal response of series and parallel R-L, R-C, R-L-C circuits. <b>Laplace transformation approach:</b> Steady state and transient response, source free, DC and sinusoidal response of series and parallel R-L, R-C, R-L-C circuits.								
<b>UNIT-II</b>	<b>TWO PORT NETWORKS</b>						<b>CLASSES:12</b>	
Open circuit impedance and short circuit admittance parameters, transmission (ABCD) and inverse transmission parameters, hybrid and inverse hybrid parameters. Interrelation between two port network parameters, image parameters, inter connection of two-port networks using cascade, series, parallel connections, terminated two port network.								
<b>UNIT-III</b>	<b>NETWORK FUNCTIONS</b>						<b>CLASSES:12</b>	
Response of RL, RC circuits for impulse and pulse excitations using Laplace transform methods. Network functions for the one port and two port networks. Poles and zeros of network functions - restrictions on pole and zero locations for driving point functions and transfer functions - time domain behavior from the pole zero plot.								
<b>UNIT-IV</b>	<b>FILTERS</b>						<b>CLASSES:12</b>	
Low pass, high pass & band pass filters - frequency response, constant K – and M – filters.								
<b>UNIT-V</b>	<b>NETWORK SYNTHESIS</b>						<b>CLASSES:12</b>	
Hurwitz polynomial – properties of Hurwitz polynomials- continued fraction expansion, properties of positive real functions – numerical problems for one port reactive network. Synthesis of RC, RL driving point impedances and RL, RC admittances – CAUER and FOSTER methods of Synthesis								
<b>Text Books:</b>								
1. M.E.Vanvalkenburg, “Network Analysis”, PHI, 3rd Edition, 2006. 2. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuit Analysis”, TMH, 8 <sup>th</sup> Edition, 2012								
<b>Reference Books:</b>								
1. A Sudhakar and Shyam Mohan SP, “Circuits and Networks: Analysis and Synthesis”, TMH, 5thEdition,2015 2. Franklin F.Kuo, "Network Analysis and Synthesis", Second Edition, John Wiley & Sons, 2009.								
<b>Web References:</b>								
1. <a href="https://www.researchgate.net">https://www.researchgate.net</a> 2. <a href="https://www.aar.faculty.asu.edu/CLASSES">https://www.aar.faculty.asu.edu/CLASSES</a> 3. <a href="https://www.facstaff.bucknell.edu/">https://www.facstaff.bucknell.edu/</a> 4. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a>								
<b>E-Text Books:</b>								
1. <a href="https://www.jntubook.com/">https://www.jntubook.com/</a>								

**Outcomes:**

1. Understand the concept of steady state, transient analysis for different circuits with DC and sinusoidal input
2. Gain knowledge about two port network parameters and interrelations of two port networks.
3. Understand the concept of pole , zero and determine the responses of different circuits for pulse and impulse excitations.
4. Gain knowledge about the coupled circuits and filters
5. Understand the concept of Hurwitz polynomial, synthesis of different networks.

## ELECTROMAGNETIC FIELDS

<b>B.Tech III Semester: Electrical &amp; Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE302	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>		<b>Tutorial Classes: 0</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>	
<b>OBJECTIVES:</b>								
1. To acquire the knowledge of Electromagnetic field theory that allows the student to have a solid theoretical foundation to be able in the future to design emission , propagation and reception of electro- magnetic wave systems 2. To identify , formulate and solve fields and electromagnetic waves propagation problems in a multidisciplinary frame individually or as a member of a group 3. To provide the students with a solid foundation in engineering fundamentals required to solve problems and also to pursue higher studies								
<b>UNIT-I</b>	<b>ELECTROSTATICS</b>						<b>CLASSES:12</b>	
Scalars and vectors, Vector Algebra, Dot product, cross product, Introduction to Cartesian, cylindrical and Spherical coordinate systems, Stoke's theorem, Divergence theorem. Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to different charge distributions – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Guass's law – Application of Guass's Law – Maxwell's first equation. Laplace's and Poisson's equations – Solution of Laplace's equation in one variable. Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field –Conductors and Insulators. Behavior of conductors in an electric field.								
<b>UNIT-II</b>	<b>DIELECTRIC &amp; MAGNETO STATICS</b>						<b>CLASSES:12</b>	
Electric field inside a dielectric material, polarization. Dielectric –Conductor and Dielectric – Dielectric boundary conditions. Capacitance, capacitance of parallel plate, spherical and co- axial capacitors with composite dielectrics. Energy stored and energy density in a static electric field, Current density – conduction and Convection current densities. Ohm's law in point form .Equation of continuity. Biot-Savart's law – Oesterd's experiment – Magnetic field intensity (MFI) – MFI due to different current distributions – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second equation.								
<b>UNIT-III</b>	<b>AMPERE'S LAW &amp; MAGNETIC FORCE</b>						<b>CLASSES:12</b>	
Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long straight current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation, Field due to a circular loop, rectangular and square loops. Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loopas a magnetic dipole – Torque on a current loop placed in a magnetic field.								
<b>UNIT-IV</b>	<b>MAGNETIC POTENTIAL &amp; INDUCTANCE</b>						<b>CLASSES:12</b>	
Scalar Magnetic potential and its limitations – vector magnetic potentialand its properties – vector magnetic potential due to simple configurations – vector Poisson's equations. Neumann's formula – determination of self inductanceof a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.								
<b>UNIT-V</b>	<b>TIME VARYING FIELDS</b>						<b>CLASSES:12</b>	
Time varying fields-Faraday's laws of electromagnetic induction-its integral and point forms, Maxwell's fourth equation, statically and dynamically induced EMFs, displacement current, Modification of Maxwell's equations for time varying fields,poyinting vector and poyinting theorem.								

**Text Books:**

1. William H. Hayt & John. A. Buck "Engineering Electromagnetics" McGraw –Hill Companies, 7<sup>th</sup> Edition. 2006..
2. Mathew N O Sadiku "Electro magnetic Fields" Oxford Publications, 7th edition, 2006. 8th Edition, 2012

**Reference Books:**

1. Kamakshaiiah "Electromagnetic fields" Right Publishers, 2007
2. J P Tewari "Electromagnetics" Khanna publishers, 4th edition, 2009

**Web References:**

1. <https://www.researchgate.net>
2. <https://www.aar.faculty.asu.edu/CLASSES>
3. <https://www.facstaff.bucknell.edu/>
4. <https://www.electrical4u.com>

**E-Text Books:**

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

**Outcomes:**

1. Understand the concepts of divergence and curl; be able to calculate line integrals, surface and volume integrals
2. Apply Gauss Law, Coulomb's law and Poisson's Equations to find fields and potentials for a variety of situations including charge distributions and capacitors.
3. Understand the behavior of magnetic and electric fields in the presence of dielectric and magnetic materials

## ELECTRICAL MACHINES – I

<b>B.Tech III Semester: Electrical &amp; Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE303	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: 60</b>		<b>Tutorial Classes: 0</b>		<b>Practical Classes: Nil</b>		<b>Total Classes: 60</b>		
<b>OBJECTIVES:</b>								
1. Understand electrical principle, laws, and working of DC machines. 2. Analyze the construction and characteristics and application of various type of DC generators. 3. Analyze the construction and characteristics and application of various type of DC motors and testing of motors according to Indian standard.								
<b>UNIT-I</b>	<b>INTRODUCTION TO D.C MACHINES</b>						<b>CLASSES:12</b>	
DC. Machine- constructional features, armature windings - lap and wave windings, DC Generator- Principle of operation, E.M.F Equation, Constant & Variable losses, Power flow diagram, Methods of Excitation, Armature reaction - Cross magnetizing and de-magnetizing AT/pole – problems, Methods of limiting the effects of armature reaction, methods of improving commutation, equalizer rings and dummy coils.								
<b>UNIT-II</b>	<b>D.C GENERATORS</b>						<b>CLASSES:12</b>	
Types of DC generators – self excited and separately excited, build-up of E.M.F, critical field resistance and critical speed-problems ,Causes for failure to self-excited and remedial measures, operating characteristics of shunt, series and compound generators - parallel operation of D.C. shunt generators - load sharing, Applications of DC generators								
<b>UNIT-III</b>	<b>D.C MOTORS</b>						<b>CLASSES:12</b>	
D.C Motors - Principle of operation - Back E.M.F., Methods of Excitation, power flow diagram, Torque Equation - problems, characteristics and application of shunt, series and compound motors.								
<b>UNIT-IV</b>	<b>SPEED CONTROL OF D.C. MOTORS</b>						<b>CLASSES:12</b>	
Speed control of D.C. Motors- Armature voltage and field flux control methods, Principle of 3point, 4 point and 2 point starters - problems								
<b>UNIT-V</b>	<b>TESTING OF D.C MACHINES</b>						<b>CLASSES:12</b>	
Losses - Constant & Variable losses - calculation of efficiency - condition for maximum efficiency - Methods of Testing - brake test – Swinburne’s test – Hopkinson’s test – Field’s test - Retardation test - separation of stray losses in a D.C. motor test.								
<b>Text Books:</b>								
1. Dr.P.S.Bhimbra, "Electric Machinery", Khanna Publishers, 7th edition, 2006. 2. J.B.Gupta, "Theory and performance of Electrical Machines", Khanna Publishers, 14 <sup>th</sup> edition, 2010								
<b>Reference Books:</b>								
1. R.K.Rajput, "A Text book of Electrical Machines", Lakshmi Publications, 2005. 2. A. E. Clayton, "The Performance and Design of Direct Current Machines (English) 1 <sup>st</sup> Edition								
<b>Web References:</b>								
1. <a href="https://www.researchgate.net">https://www.researchgate.net</a> 2. <a href="https://www.aar.faculty.asu.edu/CLASSES">https://www.aar.faculty.asu.edu/CLASSES</a> 3. <a href="https://www.facstaff.bucknell.edu/">https://www.facstaff.bucknell.edu/</a> 4. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a>								
<b>E-Text Books:</b>								
1. <a href="https://www.jntubook.com/">https://www.jntubook.com/</a>								

**Outcomes:**

1. Illustrate the constructional details and principle of operation of DC Machine
2. Summarize armature reaction and commutation in DC machines
3. Demonstrate the performance characteristics of various DC generators
4. Outline various speed control methods of DC motors
5. Summarize testing methods of DC machines

## MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

<b>B.Tech III Semester: Common to CE, EEE, ME, ECE &amp; CSE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18BS303	Core	L	T	P	C	CIA	SEE	TOTAL
		2	-	-	2	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
I. To create knowledge over economic aspects								
II. To understand modern principles and methods of microeconomics of real-world business problems.								
III. To master the knowledge over the basic tools of micro economics and real world business problems.								
IV. To understand various accounting concepts and its applications in managerial decision-making.								
<b>UNIT-I</b>							<b>CLASSES:20</b>	
Introduction to Managerial Economics: Definition, Nature and Scope of Managerial Economics– Demand Analysis: Determinants, Law of Demand and its exceptions. Elasticity of Demand: Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, methods, (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)								
<b>UNIT-II</b>							<b>CLASSES:10</b>	
Theory of Production: Production Function – Isoquants and Iso-costs, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts, types of costs, (BEA)-Determination of Break-Even Point (simple problems) Market: Types of competition, Price-Output Determination in case of Perfect Competition and Monopoly, Monopolistic competition. Methods of Pricing: Cost, competition, strategy based pricing								
<b>UNIT-III</b>							<b>CLASSES:10</b>	
Business Types: Business, features, Sole Proprietorships, Partnerships, Joint Stock Companies, Public Enterprises and their types. Capital and Capital Budgeting: Capital and its significance, Types and sources of raising finance. Nature and scope of Capital Budgeting, Features, Methods: Payback Method, Accounting Rate of Return Method (ARR) and Net Present Value Method (simple problems)								
<b>UNIT-IV</b>							<b>CLASSES:10</b>	
Financial Accounting: Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts. (Simple Problems)								
<b>UNIT-V</b>							<b>CLASSES:10</b>	
Financial Analysis through Ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS), (Simple Problems).								
<b>Text Books:</b>								
1. Managerial Economics and Financial Analysis, J.V.Prabhakar Rao, Maruthi Publications, 2011								
2. Managerial Economics and Financial Analysis, N. Appa Rao. & P. Vijaya Kumar, Cengage Publications, New Delhi, 2011								
<b>Reference Books:</b>								
1. Managerial Economics and Financial Analysis, A R Aryasri, TMH, 2011								
2. Managerial Economics, Suma damodaran, Oxford, 2011								

**Web References:**

1. <http://www.economicsdiscussion.net/production-function/least-cost-and-maximum-output-combinations-of-input/23264>
2. <https://www.ilearnlot.com/capital-budgeting-nature-importance-and-limitations/>

**E-Text Books:**

1. [https://www.iare.ac.in/sites/default/files/lecture\\_notes/IARE\\_MEFA\\_Lecture\\_NOTES\\_1.pdf](https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_MEFA_Lecture_NOTES_1.pdf)
2. [https://mrcet.com/downloads/digital\\_notes/EEE/MEFA%20DIGITAL%20NOTES.pdf](https://mrcet.com/downloads/digital_notes/EEE/MEFA%20DIGITAL%20NOTES.pdf)

**Outcomes:**

1. To introduce micro as well as macro, economic concepts that are useful in business decision making.
2. To help students better recognize the application of modern principles and methods of microeconomics to real-world business problems in different contexts.
3. To master the basic tools of microeconomics: supply and demand analysis; firms' production and pricing decisions, market equilibrium and market structure analysis.
4. The objective of this course is to acquaint the students regarding various accounting concepts and its application in managerial decision making.

## ELECTRONIC DEVICES AND CIRCUITS LABORATORY

<b>B.Tech IIISemester: Common to ECE &amp; EEE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
18EC306	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	1	25	50	75
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: Nil</b>		<b>Practical Classes: 68</b>			<b>Total Classes: 68</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
I. Know the usage of electronic equipment II. Know the testing of components III. Understand the PN diode operation in forward and reverse bias IV. Know the characteristics of Half and Full wave rectifier with and without filters V. Know how to connect transistor in CB, CE configurations								
<b>LIST OF EXPERIMENTS</b>								
<b>Part A: (Only for viva-voce Examination)</b>								
ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions):								
1. Identification, Specification, testing of R,L,C components (color codes), Potentiometers (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Board, PCB's. 2. Identification, Specification, testing of Active devices: Diodes, BJT, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT. 3. Study and operation of:								
i. Multimeters (Analog and Digital) ii. Function Generator iii. Regulated Power Supplies iv. CRO								
<b>Part B: (For Laboratory Examination – Minimum of 12 experiments)</b>								
<b>EXPT. 1</b>	<b>FORWARD AND REVERSE BIAS V-I CHARACTERISTICS OF PN JUNCTION DIODE</b>							
To verify Forward and Reverse Bias V-I characteristics of PN junction Diode								
<b>EXPT. 2</b>	<b>ZENER DIODE V-I CHARACTERISTICS AND ZENER DIODE AS VOLTAGE REGULATOR</b>							
To verify Zener diode V-I characteristics and Zener diode as voltage regulator								
<b>EXPT. 3</b>	<b>HALF WAVE RECTIFIER, WITH AND WITHOUT FILTERS</b>							
To verify Half Wave rectifier, with and without filters								
<b>EXPT. 4</b>	<b>FULL WAVE RECTIFIER WITH AND WITHOUT FILTERS</b>							
To verify Full wave rectifier with and without filters								
<b>EXPT. 5</b>	<b>INPUT AND OUTPUT CHARACTERISTICS OF A BJT IN CE CONFIGURATION AND CALCULATION OF H-PARAMETERS</b>							
To verify Input and output Characteristics of a BJT in CE configuration and calculation of h-parameters								

<b>EXPT. 6</b>	<b>INPUT AND OUTPUT CHARACTERISTICS OF A BJT IN CB CONFIGURATION AND CALCULATION OF H-PARAMETERS</b>
To verify Input and output Characteristics of a BJT in CB configuration and calculation of h-parameters	
<b>EXPT.7</b>	<b>FET CHARACTERISTICS IN CS CONFIGURATION</b>
To verify FET characteristics in CS configuration	
<b>EXPT. 8</b>	<b>DESIGN OF SELF BIAS CIRCUIT</b>
To verify self bias circuit	
<b>EXPT. 9</b>	<b>FREQUENCY RESPONSE OF CE AMPLIFIER</b>
To verify Frequency response of CE Amplifier	
<b>EXPT. 10</b>	<b>FREQUENCY RESPONSE OF CC AMPLIFIER.</b>
To verify Frequency response of CC Amplifier.	
<b>EXPT. 11</b>	<b>FREQUENCY RESPONSE OF CS FET AMPLIFIER</b>
To verify Frequency response of CS FET Amplifier	
<b>EXPT. 12</b>	<b>SCR CHARACTERISTICS</b>
To verify SCR characteristics	
<b>EXPT. 13</b>	<b>UJT CHARACTERISTICS</b>
To verify UJT characteristics	
<b>SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:</b> <b>HARDWARE:</b> RESISTORS, CAPACITORS, UJTs, BJTs,SCRs, FET, BREADBOARDS(12)	
<p><b>Course Outcome:</b> At the end of the course, a student will be able to:</p> <ol style="list-style-type: none"> <li>1. Know active and passive components and its applications</li> <li>2. Study the usage of measuring instruments and power supplies</li> <li>3. Plot and analyze the V-I characteristics of PN-junction diode &amp; zener diode and applications</li> <li>4. Plot and analyze the V-I characteristics of different configurations of BJT &amp; FET</li> </ol>	

## ELECTRICAL CIRCUITS LABORATORY

<b>B.Tech III Semester – Electrical &amp; Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>18EE305</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		-	-	2	1	25	50	75
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: 39</b>			<b>Total Classes: 39</b>			
<b>OBJECTIVES:</b>								
<ol style="list-style-type: none"> <li>1. provide hands-on experience to the students so that they are able to put theoretical concepts to practice</li> <li>2. Use computer simulation tools such as PSPICE, or Multisim to carry out design experiments as it is a key analysis tool of engineering design.</li> <li>3. Give a specific design problem to the students, which after completion they will verify using the simulation software or hardwired implementation.</li> <li>4. Understand the concept of circuit laws</li> <li>5. Solve the electrical network using mesh and nodal analysis by applying network theorems</li> <li>6. Understand the concept of resonance in series and parallel circuits.</li> </ol>								
<b>LIST OF EXPERIMENTS</b>								
<b>Expt. 1</b>	<b>VERIFICATION OF THEVENIN'S AND NORTON'S THEOREM</b>							
To verify Thevenin's and Norton's theorem								
<b>Expt. 2</b>	<b>VERIFICATION OF SUPERPOSITION THEOREM AND MAXIMUM POWER TRANSFER THEOREM.</b>							
To verify superposition theorem and maximum power transfer theorem.								
<b>Expt. 3</b>	<b>VERIFICATION OF COMPENSATION THEOREM</b>							
To verify Compensation theorem								
<b>Expt. 4</b>	<b>VERIFICATION OF RECIPROCITY AND MILLMANN'S THEOREM</b>							
To verify Reciprocity and Millmann's theorem								
<b>Expt. 5</b>	<b>LOCUS DIAGRAMS OF RL AND RC SERIES CIRCUITS</b>							
To draw the Locus diagrams of RL and RC series circuits								
<b>Expt. 6</b>	<b>SERIES AND PARALLEL RESONANCE</b>							
To conduct Series and parallel resonance								
<b>Expt.7</b>	<b>DETERMINATION OF SELF, MUTUAL INDUCTANCE AND COEFFICIENT OF COUPLING</b>							
To determine self, mutual inductance and coefficient of coupling								
<b>Expt. 8</b>	<b>VERIFICATION OF Z AND Y PARAMETERS</b>							
To determine Z and Y Parameters								
<b>Expt. 9</b>	<b>VERIFICATION OF TRANSMISSION AND HYBRID PARAMETERS</b>							

To determine Transmission and Hybrid parameters	
<b>Expt. 10</b>	<b>MEASUREMENT OF ACTIVE POWER FOR STAR AND DELTA CONNECTED BALANCED LOADS</b>
To measure active power for star and delta connected balanced loads	
<b>Expt. 11</b>	<b>MEASUREMENT OF REACTIVE POWER FOR STAR AND DELTA CONNECTED BALANCED LOADS</b>
To measure Reactive power for star and delta connected balanced load	
<b>Expt. 12</b>	<b>MEASUREMENT OF THREE PHASE POWER BY TWO WATT METER METHOD FOR UNBALANCED LOADS</b>
To measure three phase power by two Watt meter method for Unbalanced loads	
<b>Expt. 13</b>	<b>SIMULATION OF DC CIRCUITS.</b>
To perform Simulation of DC circuits	
<b>Expt. 14</b>	<b>DC TRANSIENT RESPONSE.</b>
To analyze DC transient response	
<b>Expt. 15</b>	<b>MESH ANALYSIS</b>
To perform Mesh analysis	
<b>Expt. 16</b>	<b>NODAL ANALYSIS.</b>
To perform Nodal analysis	
<b>Reference Books:</b>	
1. Electric Circuits, (Schaum's Outline Series) - McGraw-Hill Education 2. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 5th Edition, McGraw-Hill, 2012.	
<b>Web References:</b>	
3. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a> 2. <a href="https://www.researchgate.net">https://www.researchgate.net</a>	
<b>Course Home Page:</b>	
<b>SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:</b> <b>HARDWARE:</b> Theorem kits, Desktop Computers (05 nos)	
<b>Course Outcome:</b>	
1. Verify network theorems for different electrical circuits. 2. Measure active power of the balanced and unbalanced loads 3. Verify different networks by PSPICE Simulation software	

## ELECTRICAL WORKSHOP LABORATORY

<b>B.Tech III Semester – Electrical &amp; Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>18EE306</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		-	-	2	1	25	50	75
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: 39</b>			<b>Total Classes: 39</b>			
<b>OBJECTIVES:</b>								
1. To have a fair knowledge about the operation and troubleshooting of various lamps, motors and generators. 2. To test various electronic components and design various electronic circuits. 3. To understand the design of small transformers 4. To understand the practice of soldering for electronic circuits Know the concept of fabrication of PCB								
<b>LIST OF EXPERIMENTS</b>								
<b>Expt. 1</b>	<b>TROUBLESHOOTING OF VARIOUS LAMPS</b>							
To Trouble shoot various lamps								
<b>Expt. 2</b>	<b>INSTALLATION OF ELECTRICAL APPLIANCES.</b>							
To install different electrical appliances								
<b>Expt. 3</b>	<b>TROUBLESHOOTING OF ELECTRICAL MACHINES</b>							
To Trouble shoot Electrical Machines								
<b>Expt. 4</b>	<b>VARIOUS TYPES OF ELECTRICAL INSTALLATION EARTHING PROCEDURES.</b>							
To conduct various earthing procedures								
<b>Expt. 5</b>	<b>DESIGN OF SMALL TRANSFORMERS</b>							
To design transformer								
<b>Expt. 6</b>	<b>ELECTRONIC COMPONENT TESTING.</b>							
To test different Electronic components								
<b>Expt.7</b>	<b>DESIGN AND FABRICATION OF RECTIFIERS WITH FILTERS</b>							
To fabricate of rectifiers with filters								
<b>Expt. 8</b>	<b>SOLDERING PRACTICE</b>							
To perform soldering of different circuits								
<b>Expt. 9</b>	<b>STUDY OF LAYOUT OF SUBSTATION.</b>							
To Study the Layout of Substation								

<b>Expt. 10</b>	<b>DESIGN OF INDUSTRIAL HALL LIGHTING</b>
To design Industrial Hall Lighting	
<b>Expt. 11</b>	<b>CHARACTERIZATION OF ELECTRICAL CABLES</b>
To study the characteristics of cables	
<b>Expt. 12</b>	<b>FABRICATION OF PCB</b>
To fabricate PCB	
<b>Expt. 13</b>	<b>DESIGN AND FABRICATION OF ADDERS.</b>
To design Adder circuit	
<b>Expt. 14</b>	<b>DESIGN AND FABRICATION OF COUNTERS.</b>
To design counters	
<b>Expt. 15</b>	<b>DESIGN AND FABRICATION OF OSCILLATORS.</b>
To Designoscillator circuit	
<b>Reference Books:</b>	
1. Electrical Workshop: Safety, Commissioning, Maintenance & Testing of Electrical Equipment, R.P. Singh,2012, I K international publications	
<b>Web References:</b>	
1. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a> 2. <a href="https://www.researchgate.net">https://www.researchgate.net</a>	
<b>Course Home Page:</b>	
<b>SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:</b> <b>HARDWARE:</b> soldering kit, winding equipment & lamps	
<b>Course Outcome:</b>	
1. Have a fair knowledge about the operation and troubleshooting of various lamps, motors and generators. 2. Test various electronic components and design various electronic circuits. 3. Understand the design of small transformers 4. Understand the practice of soldering for electronic circuits 5. Know the concept of fabrication of PCB	

## PROFESSIONAL SOCIETY ACTIVITIES-I

<b>B.Tech III Semester: Common to CE, EEE, ME, ECE &amp; CSE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
18AS301	-	L	T	P	C	CIA	SEE	Total
		2	0	0	0	-	-	-
<b>Contact Classes: 12</b>		<b>Tutorial Classes: Nil</b>			<b>Practical Classes: Nil</b>			<b>Total Classes: 12</b>
<p><b>OBJECTIVES:</b>  <b>The course should enable the students to:</b></p> <ol style="list-style-type: none"> <li>1. Improve communication skills</li> <li>2. Develop leadership qualities</li> </ol> <p>Professional Society Activities (PSA) course is aimed at enhancing the self-learning, communication, managerial skills of the students by engaging them in various Co &amp; Extra Curricular activities during their course of study. Activities in each of the department shall be designed and conducted by the Professional Society Executive Committee whose composition is:</p> <ol style="list-style-type: none"> <li>1. Faculty Mentors- 2 No.</li> <li>2. Student Chairman: 1 No.- Final year Student</li> <li>3. Student General Secretary: 1 No.- Third year Student</li> <li>4. Treasurer: 1 No.- Third year Student</li> </ol> <p>Student Members: 2 No's from each class            PSA related activities would be of the following nature but not limited to:</p>								
<b>Activity#1</b>	Just A Minute							
<b>Activity#2</b>	Technical Quiz							
<b>Activity#3</b>	Open House- Lab Demo							
<b>Activity#4</b>	Technical Paper Presentation- Preliminary							
<b>Activity#5</b>	Technical Paper Presentation- Final							
<b>Activity#6</b>	Poster Presentation							
<b>Activity#7</b>	Collage- A theme based event							
<b>Activity#8</b>	Debate Competition							
<b>Activity#9</b>	Group Discussion Competition							
<b>Activity#10</b>	Mock Interviews							
<b>Activity#11</b>	Model Exhibition							
<b>Activity#12</b>	Valedictory Function							

## SOFT SKILLS PRACTICE

<b>B.Tech III Semester: Common to CE, EEE, ME, ECE &amp; CSE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
18AS302	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	-	-	-	-
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: 28</b>			<b>Total Classes: 28</b>			
<b>OBJECTIVES:</b>								
To give each student a realistic prospective o work & work expectation to help formulate problem solving skills.								
<b>LIST OF ACTIVITIES</b>								
<b>ACTIVITY. 1</b>	<b><u>INTRODUCTION - WHAT ARE SOFT SKILLS?</u></b>							
Importance of Soft Skills – Selling your soft skills – Attributes regarded as Soft Skills – Soft skills – Social soft skills – Thinking soft skills – Negotiating – Exhibiting your soft skills – Identifying your soft skills – improving your soft skills – will formal training enhance your soft skills – soft skills training – Train yourself – practicing soft skill – Measuring Attitude. <i>Activity: Measure your Soft Skill.</i>								
<b>ACTIVITY. 2</b>	<b><u>KNOW THYSELF / SELF-DISCOVERY</u></b>							
Introduction – Importance of knowing yourself – Process of knowing yourself – SWOT analysis – Benefits of SWOT analysis – using of SWOT analysis – SWOT analysis grid – Questions to complete the grid. <i>Activity: Know yourself.</i>								
<b>ACTIVITY. 3</b>	<b><u>DEVELOPING POSITIVE ATTITUDE</u></b>							
Introduction – Meaning – Features of Attitude – Attitude and behavior – Formation of attitudes – change of attitudes – what can you do to change attitude ? Ways of changing attitude in a person – Attitude in a work place – The power of positive attitude – Developing positive attitude – Obstacles in developing positive attitude – Staying positive – Examples of positive attitude – positive attitude and its result – staying negative – examples of negative attitude – Overcoming negative attitude – Negative attitude and its results. <i>Activity: Measure your attitude.</i>								
<b>ACTIVITY. 4</b>	<b><u>FORMING VALUES</u></b>							
Introduction – Meaning – What is a value? – A core of Values – Values relating to educations Values relating to self and others – Values relating to Civic responsibilities – Values and attitudes - Importance of values – Formation of values – Types of Values – Terminal and Instrumental Values – Power of Values – Personal Values – Cultural Values – Values – some examples. <i>Activity: Identity your values.</i>								
<b>ACTIVITY. 5</b>	<b><u>IMPROVING PERCEPTIONS</u></b>							
Introduction – Meaning – Factors influencing Perception – Perceptual process – Improving perception – Perception and its application in organizations.								

*Activity: Test your Perception.*

**ACTIVITY. 6** | **CAREER PLANNING**

Introduction – Benefits of career planning – Guidelines for choosing a career – Myths about choosing a career – Tips for successful career planning – Developing career goals – Final thoughts on career planning – Things one should know while starting career and during his career.

*Activity: Test your career interests.*

**ACTIVITY. 7** | **ART OF LISTENING**

Introduction – What is Listening? – Two ears, one mouth – Benefits of active listening – kinds of listening – Factors that hamper listening – Common poor listening habits – Advantages of active listening – Listening tips.

*Activity: Test your listening skills.*

**ACTIVITY. 8** | **ART OF READING**

Introduction – Reading is a Cognitive process – Good readers are what they read – Benefits of reading – Different types of reading – Tips for effective reading – The SQ3R Technique – Different stages of reading – Rates of reading – Determining a students’ reading rate – Adjusting reading rate – Activities for increasing reading rate – Problems with reading – Becoming an effective reader.

*Activity: Test your reading skills.*

**ACTIVITY. 9** | **BODY LANGUAGE**

Introduction – Body talk – Voluntary and involuntary body language – Forms of body language – Parts of body language – Origin of body language in building interpersonal relations – Reasons to study body language – Body language in building industrial relations – Improving body language- Types of body language – Gender differences – Female interest and body language – shaking hands with Women – Interpreting body language – Developing confidence with correct body language.

**ACTIVITY. 10** | **TEAM BUILDING AND TEAMWORK**

Introduction – Meaning – Aspects of Team building – Skills needed for Team work – A model of team building – Team vs Group – Characterizer of effective team – Role of a team leader – nine persons a successful team should have – inter – group collaboration – Advantages of Inter-group collaboration – Differences faced in intergroup collaboration.

*Activity: Test your team work skills.*

**ACTIVITY. 11** | **GROUP DISCUSSION**

Introduction – Meaning of GD – Why Group Discussion – Characters tested in a GD – Tips of GD – skills required in a GD – consequences of GD – Behaviour in a GD – Essential elements of GD – Traits tested in a GD – GD etiquette – Areas to be concentrated while preparing for a GD – Initiating a GD – Non-verbal communication in GD – Movement and Gestures to be avoided in a GD – Topics for GD.

*Activity: Group Discussion.*

**ACTIVITY. 12** | **INTERVIEW SKILLS**

Introduction – Why an interview – Type of interview – Interview panel – Types of Questions asked – Reason for selecting a candidate – Reasons for selecting a candidate – Reasons for rejecting a candidate – on the day of interview – on to the interview table – attending job fair – common mistakes that you wouldn’t want to do – question the candidate should not ask during the interview – pot interview etiquette – How does one follow- up? – Telephonic interview – Dress code at interview – Typical questions asked – Interview mistakes – quick tips – How to present well in interview – Tips to make a good impression in an interview – Job interview – Basic tips – How to search for job effectively – Interview quotations.

**ACTIVITY. 13** | **TIME MANAGEMENT**

Introduction – The 80:20 rule – Take a good look at the people around you – Examine your work – sense of time management – Time is money – Features of Time – Three secrets of time management – Time management matrix – Analysis of time matrix – Effective scheduling – Group of activities – Five steps to successful time management – difficulties in time management – Evil of not planning – time management is a myth – overcoming procrastination – ways to find free time – Time Management tips for students – Interesting facts about time – Ideal way of spending a day – time wasters – time savers – realizing the value of time – time circle planner.

Activity: Test your time management skills.

#### **ACTIVITY. 14 | STRESS MANAGEMENT**

Introduction – Meaning – At one level stress may be a positive aid to performance – At one level stress may be a negative aid to performance – Effects of stress – Kinds of stress – sources of stress – Few other common sources of stress case study – behaviors identified with stress – Assessing the existence of stress – What are signs of stress? – Spotting stress in you – stress management tips : Teenage stress – Make the mornings memorable.

#### **Text Books:**

1 Soft Skills : Life skills, Communication Skills, Employability skills and Corporate skills. Authors : S. Hariharan, N. Sundararajan and S.P. Shanmugapriya , Publishers : MJP Publishers

2 Soft Skills : Know yourself and know the world. Authors : Alex .Publishers : S Chand & Co., New Delhi.

3. Making work for highly sensitive person.  
Authors : Beverly Jaeger, Ph.D.

Publishers : Tata Mcgraw hill Education

#### **Reference Books:**

1 Thill, John V. & Courtland L. Bovée, Excellence in Business Communication, 10th edition. Boston : Pearson, 2013.

2 Thorpe, Edgar & Showick Thorpe. Winning at Interviews. 2nd Edition. Delhi: Dorling Kindersley, 2006.

#### **Web References:**

1. <http://www.indiabix.com/group-discussion/topics-with-answers/>

2. <http://www.owl.net.rice.edu/~cainproj>

#### **Outcomes:**

1. Receive the support they need to resolve issues and make decisions
2. Explore their personal resources and aptitudes
3. Understand new career prospects and strive for personal development
4. Make a proper and informed decision for their career
5. In an era of stiff competition success can only be received if one knows Team work as team work always pays rich dividends.
6. Problem solving skills for personal and professional development.

## ENVIRONMENTAL STUDIES

(Mandatory Course)

B.Tech III Semester: Common to CE, EEE, ME, ECE & CSE								
Course code	Category	Hours/week			Credits	Maximum Marks		
18MD301	H&S	L	T	P	C	CIA	SEE	TOTAL
		2	0	0	0	0	0	0
<b>Contact Classes:30</b>	<b>Tutorial Classes: 0</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 30</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
1. To create a stronger foundation in the understanding of fundamentals of environment with an applied perspective for future engineers with a focus on Engineering & Technology.								
2. To impart the awareness among the engineering students about the present day problems of environment, threats to biodiversity, social issues and excess usage of natural resources to reach the heights of technical globe with latest technologies.								
3. Prepare with perspective of “ <b>Think Globally Act Locally</b> ”								
<b>UNIT-I</b>	<b>INTRODUCTION TO ENVIRONMENTAL STUDIES</b>						<b>CLASSES:6</b>	
Introduction to Environmental Studies: Definition, scope, need for public awareness. Natural Resources: Renewable & Non-renewable resources in India, Forest Resources: Use, Deforestation-Case Studies; Water Resources: Use, Over-exploitation of surface and ground water, Environmental impacts of Dams, Floods and Droughts; Food Resources: Changes caused by agriculture, over grazing; Effects of modern agriculture-fertilizer, pesticide problems, water - logging and salinity; Energy Resources: Renewable & nonrenewable energy resources, Use of alternate energy sources.								
<b>UNIT-II</b>	<b>ECOSYSTEMS:BIODIVERSITY</b>						<b>CLASSES:6</b>	
Ecosystems: Definition, Structure of an ecosystem Functions of ecosystem- Food chains, Food web, Energy flow, Ecological pyramids Types of Ecosystems: Grass land, Desert, Forest Ecosystem, and Aquatic Ecosystem: Pond, River, and Ocean Ecosystem. Biodiversity: Definition, levels of biodiversity, Value of biodiversity, Hotspots of biodiversity, India as mega biodiversity nation, Threats to biodiversity- Poaching, Habitat loss, Endangered & endemic species of India, Conservation of biodiversity: In-situ & Ex-situ conservation.								
<b>UNIT-III</b>	<b>ENVIRONMENTAL POLLUTION</b>						<b>CLASSES:6</b>	
Environmental Pollution: Definition, Causes & Control measures of Air pollution, Water pollution, Soil pollution, noise pollution. Solid waste management: Causes, effects and control measures Role of an individual in preventing pollution.								
<b>UNIT-IV</b>	<b>SOCIAL ISSUES &amp; ENVIRONMENT</b>						<b>CLASSES:6</b>	
From unsustainable to sustainable development, water conservation, rain water harvesting, watershed management, environmental ethics & issues, possible solutions, ozone layer depletion, global warming, consumerism & waste products.								
<b>UNIT-V</b>	<b>HUMAN POPULATION AND THE ENVIRONMENT</b>						<b>CLASSES:6</b>	
Population growth, variation among nations, Population explosion-family welfare programme, Women and Child welfare, Role of Information Technology in Environment and human health, Case Studies.								
<b>Text Books:</b>								
1. Environmental Studies for Undergraduate courses by Erach.Bharucha for University Grants								

Commission, Universities press

2. Environmental Studies by R Rajagopalan, Oxford University Press.
3. Kaushik A, Kaushik CP, perspectives in environment, New International Publishers.
4. R.J.Ranjit Daniels and Jagdish Krishna Swamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi.

#### **Reference Books:**

1. P. Meenakshi, "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi, 2006.
2. G. Tyler Miller Jr., "Environmental Science – working with the Earth", Eleventh Edition, Thomson Brooks /Cole, 2006.
3. S.M. Prakash, "Environmental Studies", Elite Publishers Mangalore, 2007.
4. Raman Siva Kumar, "Principals of Environmental Science and Engineering", Second Edition, Cengage learning Singapore, 2005.
5. Dr.Pratiba Sing, Dr.AnoopSingh and Dr.Piyush Malaviya, "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd. New Delhi.

#### **Web References:**

1. [www.ugc.ac.in](http://www.ugc.ac.in)
2. <https://en.wikiboos.org>

#### **E-Text Books:**

1. Textbook of Environmental Studies for Undergraduate Courses.By Erach Bharucha (Author)
2. A Textbook of Environmental Studies. By Dr. D.K. Asthana.

#### **Outcomes:**

At the end of the course students able to

1. Apply their knowledge in biology, physics, chemistry, earth science and economics for better understanding of earth's environment.
2. Understanding the importance of natural resources.
3. Comprehend the environmental problems from multiple perspectives with emphasis on human modern life style and developmental activities.
4. Influence his society in proper utilization of goods & services.
5. Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
6. Recognize the inter connectedness of human dependence on earth's ecosystems- Understanding the value of bio diversity & the conservation of biodiversity.

## FLUID MECHANICS AND HYDRAULIC MACHINERY

<b>B.Tech IV Semester: Common to ME &amp; EEE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18ME302</b>	<b>Core</b>	L	T	P	C	CIA	SEE	TOTAL
		3	-	-	3	30	70	100
<b>Contact Classes:54</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 54</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
I. Know the basic properties and calculations pressure measurement.								
II. Understand the Kinematic and dynamic properties.								
III. Learn the basic turbomachinery and basic concepts.								
IV. Learn Evaluation and performance of turbines.								
<b>UNIT-I</b>	<b>BASIC CONCEPTS AND PROPERTIES</b>						<b>CLASSES:10</b>	
Fluid – definition, the distinction between solid and fluid - Modules and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapor pressure, capillary and surface tension. Fluid statics concept of fluid static pressure, absolute and gauge pressures – pressure measurements by manometers and pressure gauges.								
<b>UNIT-II</b>	<b>FLUID KINEMATICS AND FLUID DYNAMICS</b>						<b>CLASSES:9</b>	
Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three-dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - flow net.								
<b>UNIT-III</b>	<b>FLUID DYNAMICS &amp; PRINCIPLES OF HYDRAULIC TURBINES</b>						<b>CLASSES:12</b>	
Equations of motion - Euler's equation along a streamline - Bernoulli's equation, applications - Venturimeter, Orificemeter, Pivot tube. Impulse and Reaction Turbines - Pelton Turbine – Francis Turbine – Kaplan Turbine, working principles, design principles.								
<b>UNIT-IV</b>	<b>BASICS OF TURBOMACHINERY</b>						<b>CLASSES:11</b>	
Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at the tip, velocity diagrams, work is done and efficiency, flow over radial vanes.								
<b>UNIT-V</b>	<b>PERFORMANCES OF TURBINES</b>						<b>CLASSES:12</b>	
Drawtubetheory and efficiency: specific speed, unit quantities, characteristic curves of hydraulic turbines. Cavitation: causes and effects HydraulicPumps definition and classifications. Centrifugal pump classifications, working principles, velocity triangles, specific speed, efficiency and performance curves.								
<b>Text Books:</b>								
1.Som, S. K., & Biswas, G. Introduction to fluid mechanics and fluid machines: Tata McGraw-Hill.								
2. Bansal, R. K. A textbook of fluid mechanics and hydraulic machines: (in S.I. units): Laxmi Publications.								
3. Massey, B. S., & Ward-Smith, J. Mechanics of fluids: Stanley Thornes.								
<b>Reference Books:</b>								
1. R. W., McDonald, A. T., & Pritchard, P. J. Introduction to fluid mechanics: Wiley.								
2. A. K. Jain;Fluid Mechanics, Khanna Publishers, Delhi.								
3. D.S. Kumar Kataria,Fluid Mechanics & Fluid Power Engineering, Publishers:D.S. Kumar,								

Kataria&Sons.

4. Kumar K.L.,Engineering Fluid Mechanics, Eurasia Publishing House (P) Ltd., New Delhi.

**Web References:**

1. <https://nptel.ac.in/courses/112104117/>
2. <https://easyengineering.net/a-textbook-of-fluid-mechanics-and-and-hydraulic-machines-bansal/>
3. <https://lecturenotes.in/subject/95/fluid-mechanics-and-hydraulic-machines-fmhm>
4. <https://nptel.ac.in/downloads/112106200/>

**E-Text Books:**

1. <https://www.pdfdrive.com/fluid-mechanics-and-hydraulic-machines-e18705469.html>
2. <https://insightgovtexam.com/basic-fluid-mechanics-and-hydraulic-machines-pdf-free-download/>

**OUTCOMES:**

At the end of the course students able to

1. Employ the basic knowledge of hydraulics in finding fluid properties, performance parameters of hydraulic turbines and pumps.
2. To study 1-D viscous and non-viscous flow through pipes. Bernoulli's equation, laminar and turbulent flow.
3. Present feasible design solutions for the construction of efficient hydraulic turbines and pumps.
4. Identify the manageable areas in hydraulic machinery to reduce the mechanical losses.

## DIGITAL ELECTRONICS

<b>B.Tech IV Semester: Electrical &amp; Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EC406</b>	<b>Core</b>	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: 0</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits								
2. To prepare students to perform the analysis and design of various digital electronic circuits								
<b>UNIT-I</b>	<b>DIGITAL CODES&amp; BOOLEAN ALGEBRA</b>						<b>CLASSES:12</b>	
Types of number systems – complement representation of Negative numbers, Implementation of simple arithmetic operations and conversions using Decimal, Binary, Octal and Hexa-Decimal numbers. Error detecting & Error correcting codes- Hamming codes. Fundamental postulates of Boolean algebra, basic theorems and properties, Switching functions, Canonical and Standard form, algebraic simplification, digital logic gates, properties of XOR gates, universal gates, multilevel NAND/NOR realizations.								
<b>UNIT-II</b>	<b>MINIMIZATION OF SWITCHING FUNCTIONS</b>						<b>CLASSES:12</b>	
Map Methods, Prime Implicants, Don't care combinations, Minimal SOP and POS forms, tabular method, Prime- Implicant chart, Simplification Rules.								
<b>UNIT-III</b>	<b>COMBINATIONAL LOGIC DESIGN</b>						<b>CLASSES:12</b>	
Design using conventional Logic Gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Introduction to Modular design using IC chips, MUX Realization of switching functions, Parity bit generator, Code- converters.								
<b>UNIT-IV</b>	<b>PROGRAMMABLE LOGIC DEVICES</b>						<b>CLASSES:12</b>	
Basic PLD's:-ROM, PROM, PAL, PLA. Realization of Switching functions using PLD's.								
<b>UNIT-V</b>	<b>SEQUENTIAL CIRCUITS</b>						<b>CLASSES:12</b>	
Classification of sequential circuits- Synchronous, Asynchronous, Pulse mode, Level mode with examples, Basic Flip-Flops, Triggering and Excitation Tables. Steps in Synchronous Sequential Circuit Design. Design of modulo -N Ring & Shift counters, Serial Binary Adder, Sequence Detector								
<b>Text Books:</b>								
1. A.Anand Kumar, Switching Theory and Logic Design, 1st ed., PHI, 2011.								
2. Morris Mano, Digital Design, 3rd ed., PHI, 2008.								
<b>Reference Books:</b>								
1. Charles H. Roth, Fundamentals of logic design, 5th ed., Thomson Publications,2006.								
2. ZviKohavi, Switching & Finite Automata Theory, 2nd ed., TMH, 1979.								
<b>Web References:</b>								
1. <a href="https://www.researchgate.net">https://www.researchgate.net</a>								
2. <a href="https://www.aar.faculty.asu.edu/CLASSES">https://www.aar.faculty.asu.edu/CLASSES</a>								
3. <a href="https://www.facstaff.bucknell.edu/">https://www.facstaff.bucknell.edu/</a>								
4. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a>								
<b>E-Text Books:</b>								
1. <a href="https://www.jntubook.com/">https://www.jntubook.com/</a>								
2. <a href="https://www.freeengineeringbooks.com">https://www.freeengineeringbooks.com</a>								

**Outcomes:**

1. Differentiate between analog and digital representations.
2. Use De-Morgan's theorem to simplify logic expressions.
3. Use Boolean algebra and K-map as tool to simplify and design logic circuits.
4. Construct and analyze the operation of flip-flop and troubleshoot various types of flip flop.

## ELECTRICAL MACHINES-II

<b>B.Tech IV Semester: Electrical &amp; Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE401	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>		<b>Tutorial Classes: 0</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>	
<b>OBJECTIVE:</b>								
To learn working principle, construction, operation and performance of Transformers, Induction Motors								
<b>UNIT-I</b>	<b>SINGLE PHASE TRANSFORMERS</b>						<b>CLASSES:12</b>	
Constructional features and methods of cooling of transformers, ideal transformer, EMF equation, no load and load phasor diagram, equivalent circuit of single phase transformers, losses, per unit systems, auto transformers. OC and SC tests, Sumpner's test, Regulation, efficiency and all day efficiency								
<b>UNIT-II</b>	<b>THREE PHASE TRANSFORMERS</b>						<b>CLASSES:12</b>	
Three phase transformer windings and its connections star-star, star-delta, delta-star, delta-delta, zig-zag and Vector grouping. Open delta, Tertiary transformer winding, Scott connected transformers, Parallel operation of transformer with equal and unequal voltage ratios and its load sharing. Tap changing. Cooling of transformers.								
<b>UNIT-III</b>	<b>POLYPHASE INDUCTION MOTORS</b>						<b>CLASSES:12</b>	
Construction, Rotating magnetic field in three phase systems, operation of squirrel cage and slip ring 3-phase induction motors, torque equation and torque slip characteristics, equivalent circuit, losses, efficiency, testing of induction motors and circle diagram. Types of starters, Crawling, Cogging, Double cage rotors, Induction generators and their applications.								
<b>UNIT-IV</b>	<b>SPEED CONTROL OF THREE PHASE INDUCTION MOTOR</b>						<b>CLASSES:12</b>	
Speed control of induction motors-Stator voltage control, frequency control, V/f control, pole changing and cascading, injection of EMF into rotor circuit (qualitative treatment only).								
<b>UNIT-V</b>	<b>SINGLE PHASE INDUCTION MOTORS</b>						<b>CLASSES:12</b>	
Double field revolving theory, starting methods – split phase, capacitor start and run, shaded pole motors and their characteristics and applications, No-load and blocked rotor test, equivalent Circuit								
<b>Text Books:</b>								
1. D.P.Kothari and I.J.Nagrath, "Electrical Machinery" 4th edition, Tata McGraw-Hill-2006.								
2. Dr.P.S.Bhimbra, "Electric Machinery", 7th edition, Khanna Publishers, 2009.								
<b>Reference Books:</b>								
1. Alexander S.Langsdorf, "Theory of Alternating current machinery", 35 <sup>th</sup> reprint, Tata McGraw-Hill, 1999.								
2. Ashfaq Hussain, "Electric Machines", 2nd edition, Dhanpath Rai and Co, 2014.								
<b>Web References:</b>								
1. <a href="https://www.researchgate.net">https://www.researchgate.net</a>								
2. <a href="https://www.aar.faculty.asu.edu/CLASSES">https://www.aar.faculty.asu.edu/CLASSES</a>								
3. <a href="https://www.facstaff.bucknell.edu/">https://www.facstaff.bucknell.edu/</a>								
4. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a>								
<b>E-Text Books:</b>								
1. <a href="https://www.jntubook.com/">https://www.jntubook.com/</a>								
2. <a href="https://www.freeengineeringbooks.com">https://www.freeengineeringbooks.com</a>								

**Outcomes:**

1. Describe the construction, operation and Estimate performance of single phase transformer
2. Discriminate different winding connections of three phase transformer and Explain the operation of Auto transformer
3. Understand the construction, operation, testing and analysis of different types of three phase induction motors and associated starters
4. Discuss the speed control methods of 3-phase induction motor and understand the principle, starting methods of single phase induction motors

## GENERATION OF ELECTRICAL POWER

<b>B.Tech IV Semester: Electrical &amp; Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE402	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: 60</b>	<b>Tutorial Classes: 0</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 65</b>			
<b>OBJECTIVES:</b>								
1. To introduce the concepts and phenomenon of different sources of Power Generation. 2. To impart the knowledge of different turbines used in the generating stations with the analytical methods 3. To familiarize the students with the Tariff methods for electrical energy consumption in the prospect of optimum utilization of electrical energy.								
<b>UNIT-I</b>	<b>HYDRO-ELECTRIC POWER PLANTS</b>						<b>CLASSES:12</b>	
Introduction of Hydro-electric plant & its layout. Advantages and disadvantages of Hydro-electric plants, selection of site for Hydro-electric plant, essential parts & features of Hydro-electric power plant, classification of Hydro-electric power plants depending on load & head, Types of turbines.								
<b>UNIT-II</b>	<b>THERMAL &amp; NUCLEAR POWER PLANTS</b>						<b>CLASSES:12</b>	
Schematic layout of thermal power station (TPS), description of TPS components: economizer, boilers, super heaters, turbine, condensers, electro static precipitator (ESP), chimney and cooling tower. Principle and operation of nuclear reactors, different Reactor components, radiation hazards and safety precautions, Types of nuclear reactors-PWR, BWR and FBR.								
<b>UNIT-III</b>	<b>BIOGAS AND GEOTHERMAL PLANTS, PRINCIPLES OF SOLAR POWER GENERATION</b>						<b>CLASSES:12</b>	
Principles of bio conversion, types and characteristics of bio gas digesters. Principle & method of harnessing geothermal energy, schematic layout of geothermal power plant. Basics principles of solar cells, various types of solar modules, Role and potential of solar energy options, Principles of Solar radiation. Types of Solar Energy collectors, Different methods of solar energy storage, solar applications.								
<b>UNIT-IV</b>	<b>ECONOMIC ASPECTS OF POWER GENERATION</b>						<b>CLASSES:12</b>	
Load curve, load duration, integrated load duration curves; Load, Demand, diversity, capacity and Plant use factors, numerical Problems, classification of costs: fixed, semi fixed and Running costs.								
<b>UNIT-V</b>	<b>TARIFF METHODS</b>						<b>CLASSES:12</b>	
Desirable characteristics of a Tariff method - Tariff methods: flat rate, block rate, two part, three part and power factor tariff methods and Numerical problems.								
<b>Text Books:</b>								
1. V.K.Mehta and Rohith Mehta, Principles of Power Systems, S Chand & Company Ltd, New Delhi, 4th Multi-color illustrative edition, 2006. 2. GD Rai "Non Conventional Energy Sources "Khanna Publishers, 4th edition 2000.								
<b>Reference Books:</b>								
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.								
<b>Web References:</b>								
1. <a href="https://www.researchgate.net">https://www.researchgate.net</a> 2. <a href="https://www.aar.faculty.asu.edu/CLASSES">https://www.aar.faculty.asu.edu/CLASSES</a> 3. <a href="https://www.facstaff.bucknell.edu/">https://www.facstaff.bucknell.edu/</a> 4. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a>								
<b>E-Text Books:</b>								

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

**Outcomes:**

1. Understand the principle and operation of conventional energy sources like thermal, nuclear power and Hydro generation.
2. Understand safety issues in nuclear power generation.
3. Understand the principle and operation of non- conventional energy sources like solar, biomass and geothermal energy sources.
4. Evaluate the economics of power generation.
5. Design proper methodology for power tariff

## ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

<b>B.Tech IV Semester: Electrical &amp; Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE403	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>		<b>Tutorial Classes: 0</b>		<b>Practical Classes: Nil</b>		<b>Total Classes: 65</b>		
<b>OBJECTIVES:</b>								
<ol style="list-style-type: none"> <li>1. To introduce students to monitor, analyze and control any physical system.</li> <li>2. To understand students how different types of meters work and their construction</li> <li>3. To provide a student a knowledge to design and create novel products and solutions for real life problems.</li> <li>4. To introduce students a knowledge to use modern tools necessary for electrical projects.</li> </ol>								
<b>UNIT-I</b>	<b>MEASURING INSTRUMENTS &amp; INSTRUMENT TRANSFORMERS</b>						<b>CLASSES:12</b>	
Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC , moving iron type instruments – expression for the deflecting torque and control torque – Errors , extension of range using shunt and series resistance - Types of P.F. Meters –single phase. Construction and principle of operation CT and PT – Ratio and phase angle errors.								
<b>UNIT-II</b>	<b>MEASUREMENT OF POWER / ENERGY &amp; POTENTIOMETERS</b>						<b>CLASSES:12</b>	
Single phase dynamometer wattmeter, expression for deflecting and control torques. Single phase induction type energy meter – driving and braking torques – errors. Principle and operation of D.C. Crompton’s potentiometer- standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate types- standardization - applications.								
<b>UNIT-III</b>	<b>D.C &amp; A.C BRIDGES</b>						<b>CLASSES:12</b>	
Method of measuring low, medium and high resistance – Whetstone’s bridge – measurement of low resistance: Kelvin’s double bridge - measurement of high resistance: loss of charge method. Measurement of low & high inductance - Maxwell’s, Hays and Anderson’s bridge - Measurement of capacitance and loss angle – Schering bridge.								
<b>UNIT-IV</b>	<b>MAGNETIC MEASUREMENTS &amp; DIGITAL METERS</b>						<b>CLASSES:12</b>	
Measurement of flux, method of reversals. Digital Voltmeter-Successive approximation, ramp type-Digital frequency meter-Digital multimeter-Digital Tachometer								
<b>UNIT-V</b>	<b>TRANSDUCERS</b>						<b>CLASSES:12</b>	
Definition of transducers, Classification of transducers- Principle operation of LVDT transducers- Strain gauge and its principle of operation.								
<b>Text Books:</b>								
<ol style="list-style-type: none"> <li>1. A.K.Sawhney “Electrical &amp; Electronic Measurement &amp; Instruments” Dhanpat Rai &amp; Co. Publications. 1994</li> <li>2. R.K.Rajput “Electrical &amp; Electronic Measurement &amp; Instrumentation”, S. Chand &amp; Co 2nd Edition. 2008</li> </ol>								
<b>Reference Books:</b>								
<ol style="list-style-type: none"> <li>1. D O Doebelin “Measurements Systems, Applications and Design”, Mc Graw Hill Edition</li> <li>2. Buckingham and Price “Electrical Measurements “, Prentice Hall of India.</li> </ol>								
<b>Web References:</b>								
<ol style="list-style-type: none"> <li>1. <a href="https://www.researchgate.net">https://www.researchgate.net</a></li> <li>2. <a href="https://www.aar.faculty.asu.edu/CLASSES">https://www.aar.faculty.asu.edu/CLASSES</a></li> <li>3. <a href="https://www.facstaff.bucknell.edu/">https://www.facstaff.bucknell.edu/</a></li> <li>4. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a></li> </ol>								
<b>E-Text Books:</b>								
<ol style="list-style-type: none"> <li>1. <a href="https://www.jntubook.com/">https://www.jntubook.com/</a></li> <li>2. <a href="https://www.freeengineeringbooks.com">https://www.freeengineeringbooks.com</a></li> </ol>								

**Outcomes:**

1. To understand the various Measuring instruments used to detect various electrical quantities.
2. To gain knowledge about measuring electrical parameters using AC and DC bridges
3. To analyze the various Types of Instrument Transformers.
4. To enhance student knowledge how a Measuring instruments can be designed to reduce the errors and to increase efficiency.
5. To become familiar with Analog and Digital instruments.

## MANAGEMENT SCIENCE

<b>B.Tech IV Semester: Common to ECE &amp; EEE</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18ME306	Core	L	T	P	C	CIA	SEE	TOTAL
		3	-	-	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
I. To inculcate knowledge over management practices in the organization								
II. The objective of this course is to learn the production concepts and different types of layouts for business purpose								
III. To enable the students know about the inventory methods and its evolution								
IV. To learn about consumers behavior and its factors. And also learn about the compensation, training and development facilities of employees.								
V. To know about the strategic management process and SWOT analysis of companies.								
<b>UNIT-I</b>						<b>CLASSES:10</b>		
Introduction to management and organization: Nature of management, functions of management. Taylor's scientific management, Fayol's principles of management, Maslow's theory, Douglas theory X & Theory Y, Herzberg theory, systems approaches to management, leadership styles, social responsibilities of management, Departmentation & Decentralization, types of organization Structures.								
<b>UNIT-II</b>						<b>CLASSES:10</b>		
Operations & Materials Management: Plant layout, types of plant layout-Methods of production (Job, batch, & Mass production), work study, statistical quality control, R-chart, C-chart, P-chart & Xchart (simple problems). Inventory control, Economic Order Quantity (EOQ), ABC analysis, supply chain management.								
<b>UNIT-III</b>						<b>CLASSES:10</b>		
Marketing Management & Human resource: Factions of marketing, marketing mix, marketing strategies, distribution channels. Manpower planning, recruitment, selection, T&D, placement, wage & salary administration, promotion, transfer, performance appraisal, welfare administration.								
<b>UNIT-IV</b>						<b>CLASSES:20</b>		
Project management: Network Analysis, PERT, CPM, identifying critical path, project cost analysis, project crashing (simple problems).								
<b>UNIT-V</b>						<b>CLASSES:10</b>		
<b>Strategic Management:</b> Mission, goals, objectives, policy, programmes, corporate planning process, environmental scanning, SWOT analysis, steps in strategy formulation & implementation.								
<b>Text Books:</b>								
1. Management Science – A.R.Aryasri, TMH.								
<b>Reference Books:</b>								
1. Management Science – Siddiqui & Siddqui, TMH								
2. Prasad LM, Principles and Practices of Management, Sultan Chand & Sons, New Delhi								
3. Marketing Management – Phillip Kotler, 11/e, pearson, 2007								
4. Personnel and Human Resource management – P.Subbarao – Himalaya Publication.								
5. Production and operation management – Aswathappa.K, Himalaya Publication House, Mumbai.								
<b>Web References:</b>								
1. <a href="http://www.icmrindia.org/courseware/Operations%20Management%202nd%20Edition/Materials%20Management.htm">http://www.icmrindia.org/courseware/Operations%20Management%202nd%20Edition/Materials%20Management.htm</a>								

2. <https://www.google.com/search?q=manpower+planning&oq=Manpower+planning&aqs=chrome..69l68j0j4&sourceid=chrome&ie=UTF-8>

**E-Text Books:**

1. [https://mrcet.com/downloads/digital\\_notes/ECE/II%20Year/Management%20Science.pdf](https://mrcet.com/downloads/digital_notes/ECE/II%20Year/Management%20Science.pdf)

2. [http://www.crectirupati.com/sites/default/files/lecture\\_notes/MS%20Lecture%20notes.pdf](http://www.crectirupati.com/sites/default/files/lecture_notes/MS%20Lecture%20notes.pdf)

**Outcomes:**

1. The end of the course students can have knowledge over various management aspects.
2. They can improve knowledge over various production aspects and different types of layouts and its application in manufacturing concern.
3. They can have knowledge over various decision-making aspects of the business.

## FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

<b>B.Tech IV Semester: Electrical &amp; Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>18ME308</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		-	-	2	1	25	50	100
<b>Contact Classes: Nil</b>		<b>Tutorial Classes: Nil</b>		<b>Practical Classes: 42</b>		<b>Total Classes: 42</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
I. Use various flow measurement instruments.								
II. Calculate the losses and discharge in pipes and conduct performance tests on pumps and turbines to find the efficiency.								
III. Demonstrate a systematic approach in conducting experiments.								
IV. Prepare reports on the data collected and draw inferences.								
<b>LIST OF EXPERIMENTS</b>								
<b>Expt. 1</b>	<b>VENTURI METER</b>							
Calibration of Venturimeter.								
<b>Expt. 2</b>	<b>ORIFICEMETER</b>							
Calibration of Orificemeter.								
<b>Expt. 3</b>	<b>FRICITION FACTOR IN FLOW THROUGH PIPES</b>							
Determination of Friction Factor in Flow through Pipes.								
<b>Expt. 4</b>	<b>MINOR LOSSES IN FLOW THROUGH PIPES</b>							
Determination of various minor losses in Flow through Pipes.								
<b>Expt. 5</b>	<b>IMPACT OF JET ON VANES</b>							
Impact of Jet on Vanes								
<b>Expt. 6</b>	<b>TURBINE FLOW METER</b>							
Calibration of turbine flow meter.								
<b>Expt.7</b>	<b>SINGLE STAGE CENTRIFUGAL PUMP</b>							
Performance Test on single stage Centrifugal Pump.								
<b>Expt. 8</b>	<b>MULTISTAGE CENTRIFUGAL PUMP</b>							
Performance Test on Multistage Centrifugal Pump.								
<b>Expt. 9</b>	<b>RECIPROCATING PUMP</b>							
Performance Test on Reciprocating Pump.								
<b>Expt. 10</b>	<b>PELTON WHEEL</b>							
Performance Test on pelton wheel								
<b>Reference Books:</b>								

1. H Modi, Seth, "Hydraulics, Fluid Mechanics and Hydraulic Machinery", Rajsons Publications, 20th Edition, 2013
2. Rajput, "Fluid Mechanics and Hydraulic Machines", S.Chand & Co, 6th Edition, 1998

#### **Web References:**

1. [https://nptsel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/fluid\\_mechanics/index.htm](https://nptsel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/fluid_mechanics/index.htm)
2. D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", Kotaria & Sons, 2013.

#### **Course Home Page:**

#### **SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:**

**SOFTWARE:** NO

**HARDWARE:** Venturimeter, Orificemeter, Flow through Pipes, Jet on Vanes, turbine flow meter, single stage Centrifugal Pump, Multistage Centrifugal Pump, Reciprocating Pump and pelton wheel.

#### **Course Outcome:**

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

1. Find out coefficient of discharge on Venturi meter and Orifice meter.
2. Loss of energy due to friction.
3. Displacement of vanes by water jet.
4. Performance of Multistage Centrifugal Pump.

## ELECTRICAL MACHINES LABORATORY-I

<b>B.Tech IV Semester – Electrical &amp; Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>18EE404</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		-	-	2	1	25	50	75
<b>Contact Classes: Nil</b>		<b>Tutorial Classes: Nil</b>		<b>Practical Classes: 39</b>			<b>Total Classes: 39</b>	
<b>OBJECTIVES:</b>								
1. To prepare the students to have a basic knowledge of DC generators								
2. To prepare the students to have a basic knowledge of DC motors								
<b>LIST OF EXPERIMENTS</b>								
<b>Expt. 1</b>	<b>MAGNETIZATION CHARACTERISTICS OF DC SHUNT GENERATOR</b>							
To draw Magnetization characteristics of DC Shunt Generator								
<b>Expt. 2</b>	<b>LOAD TEST ON DC SHUNT GENERATOR</b>							
To conduct Load test on DC Shunt Generator								
<b>Expt. 3</b>	<b>LOAD TEST ON DC SERIES GENERATOR</b>							
To conduct Load test on DC Series Generator								
<b>Expt. 4</b>	<b>LOAD TEST ON DC COMPOUND GENERATOR</b>							
To conduct Load test on DC Compound Generator								
<b>Expt. 5</b>	<b>HOPKINSON'S TEST ON DC SHUNT MACHINES</b>							
To conduct Hopkinson's test on DC Shunt Machines								
<b>Expt. 6</b>	<b>FIELD TEST ON DC SERIES MACHINES</b>							
To conduct Field test on DC Series Machines								
<b>Expt.7</b>	<b>SWINBURNE'S TEST</b>							
To conduct Swinburne's test								
<b>Expt. 8</b>	<b>SPEED CONTROL OF DC SHUNT MOTOR</b>							
To perform Speed control of DC Shunt Motor								
<b>Expt. 9</b>	<b>BRAKE TEST ON DC SHUNT MOTOR</b>							
To perform Brake test on DC Shunt Motor								
<b>Expt. 10</b>	<b>RETARDATION TEST ON DC SHUNT MOTOR</b>							
To perform Retardation test on DC Shunt Motor								
<b>Expt. 11</b>	<b>SEPARATION OF LOSSES IN DC SHUNT MOTOR</b>							
To Separate losses in DC Shunt Motor								

<b>Expt. 12</b>	<b>BRAKE TEST ON DC COMPOUND MOTOR</b>
To perform Brake test on DC Compound Motor	
<b>Expt. 13</b>	<b>BRAKE TEST ON DC SERIES MOTOR</b>
To perform Brake test on DC Series Motor	
<b>Reference Books:</b>	
1.Dr.P.S.Bhimbra, "Electric Machinery", Khanna Publishers, 7th edition, 2006.. 2. J.B.Gupta, "Theory and performance of Electrical Machines", Khanna Publishers,14th edition, 2010	
<b>Web References:</b>	
1. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a> 2. <a href="https://www.researchgate.net">https://www.researchgate.net</a>	
<b>Course Home Page:</b>	
<b>SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:</b> <b>HARDWARE:</b> soldering kit, winding equipment & lamps	
<b>Course Outcome:</b>	
<ol style="list-style-type: none"> <li>1. Identify the practical methods to evaluate the performance of DC shunt machines</li> <li>2. Apply various methods to find the efficiency of DC series machines.</li> <li>3. Find the efficiency of DC compound machine at different loads.</li> <li>4. Analyze various losses of DC machine by performing indirect tests.</li> <li>5. Find stray losses of a dc shunt machines using two similar machines</li> <li>6. Apply speed control techniques of DC motors to industrial applications.</li> </ol>	

## MEASUREMENTS AND INSTRUMENTATION LAB

<b>B.Tech IV Semester – Electrical &amp; Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>18EE405</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		-	-	2	1	25	50	75
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: 39</b>			<b>Total Classes: 39</b>			
<p><b>OBJECTIVE:</b> student able to know            Accuracy of measurement and error analysis. Absolute and secondary instruments and indicating instrument. Moving coil and moving iron instruments. Dynamometer type instruments. Induction type instruments. Wattmeter of Measuring of power and power factor. Bridges (DC). Bridges (AC). Current and potential transformers. Oscilloscopes.</p>								
<b>LIST OF EXPERIMENTS</b>								
<b>Expt. 1</b>	<b>CALIBRATION AND TESTING OF SINGLE-PHASE ENERGY METER</b>							
Calibration and Testing of single phase energy Meter								
<b>Expt. 2</b>	<b>CALIBRATION OF DYNAMOMETER POWER FACTOR METER</b>							
Calibration of dynamometer power factor meter								
<b>Expt. 3</b>	<b>CROMPTON D.C. POTENTIOMETER – CALIBRATION OF PMMC AMMETER AND PMMC VOLTMETER</b>							
Calibration of PMMC ammeter and PMMC voltmeter								
<b>Expt. 4</b>	<b>KELVIN’S DOUBLE BRIDGE – MEASUREMENT OF RESISTANCE – DETERMINATION OF TOLERANCE</b>							
To measure resistance by kelvin’s double bridge method								
<b>Expt. 5</b>	<b>MEASUREMENT OF CAPACITANCE USING SCHERING BRIDGE &amp; ANDERSON BRIDGE.</b>							
To measure capacitance using Schering Bridge & Anderson Bridge.								
<b>Expt. 6</b>	<b>MEASUREMENTS OF 3 PHASE REACTIVE POWER WITH SINGLE-PHASE WATTMETER.</b>							
To measure reactive power with single-phase wattmeter.								
<b>Expt.7</b>	<b>MEASUREMENT OF PARAMETERS OF A CHOKE COIL USING 3 VOLTMETER AND 3 AMMETER METHODS. LAMPS</b>							
To measure parameters of a choke coil using 3 voltmeter and 3 ammeter methods. lamps								
<b>Expt. 8</b>	<b>CALIBRATION LPF WATTMETER – BY PHANTOM TESTING</b>							
To calibrate LPF wattmeter – by Phantom testing								
<b>Expt. 9</b>	<b>MEASUREMENTS OF 3 PHASE POWER WITH TWO WATT METER METHOD (BALANCED &amp; UNBALANCED).</b>							
To measure 3 phase power with Two watt meter method (Balanced & Unbalanced).								
<b>Expt. 10</b>	<b>LVDT AND CAPACITANCE PICKUP – CHARACTERISTICS AND CALIBRATION</b>							
To study LVDT								

<b>Expt. 11</b>	<b>RESISTANCE STRAIN GAUGE – STRAIN MEASUREMENTS AND CALIBRATION</b>
To study Resistance strain gauge – strain measurements and Calibration	
<b>Expt. 12</b>	<b>TRANSFORMER TURNS RATIO MEASUREMENT BY USING AC BRIDGE.</b>
To perform Transformer turns ratio measurement by using AC bridge	
<b>Expt. 13</b>	<b>A.C. POTENTIOMETER – CALIBRATION OF AC VOLTMETER, PARAMETERS OF CHOKE.</b>
A.C. Potentiometer – Calibration of AC Voltmeter, Parameters of Choke.	
<b>Expt. 14</b>	<b>MEASUREMENT OF INDUCTANCE BY MAXWELL’S BRIDGE AND MEASUREMENT OF CAPACITANCE BY WIEN’S BRIDGE.</b>
To perform Measurement of inductance by Maxwell’s bridge and measurement of capacitance by Wien’s bridge.	
<b>Reference Books:</b>	
1.A.K.Sawhney “Electrical & Electronic Measurement & Instruments” Dhanpat Rai & Co. Publications. 1994 2. R.K.Rajput “Electrical & Electronic Measurement & Instrumentation”, S. Chand & Co 2nd Edition. 2008	
<b>Web References:</b>	
1. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a> 2. <a href="https://www.researchgate.net">https://www.researchgate.net</a>	
<b>Course Home Page:</b>	
<b>SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:</b> <b>HARDWARE:</b> Kits	
<b>Course Outcome:</b>	
1. Measure the constitutive parameters like resistance, inductance and capacitance using bridge methods. 2.Measure power and energy; calibrate single phase energy meter 3.Conduct experiments with Transducers like LVDT, strain gauge to find displacement and strain. 4.Conduct experiments with LPF wattmeter – by Phantom testing	

## TECHNICAL SEMINAR

<b>B.Tech IV Semester – Electrical &amp; Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>18EE406</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		-	2	0	1	50	-	50
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: 25</b>		<b>Practical Classes: -</b>		<b>Total Classes: 25</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
<ul style="list-style-type: none"> <li>1. Distinguish the multiple senses of a text (literal and beyond the literal).</li> <li>1. Identify and understand assumptions, theses &amp; arguments that exist in the work of authors.</li> <li>1. Evaluate and synthesize evidence in order to draw conclusions consistent with the text.</li> </ul>								
<p>There shall be a Technical seminar presentation in B.Tech IV Semester. A Technical Seminar shall have two components, one chosen by the student from the course work as an extension and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar topics shall be made before a committee consisting of Head of the department, seminar supervisor and a senior faculty member. Each Technical Seminar shall be evaluated for 50 marks. Technical Seminar component-I for 25 marks and component-II for 25 marks making total 50 marks. <b>(Distribution of marks for 25:5 marks for report, 5 marks for subject content, 10 marks for presentation and 5 marks for queries).</b></p>								

## PROFESSIONAL SOCIETY ACTIVITIES-II

<b>B.Tech IV Semester: Common to CE, EEE, ME, ECE &amp; CSE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
18AS401	-	L	T	P	C	CIA	SEE	Total
		2	0	0	0	0	-	-
<b>Contact Classes: 12</b>		<b>Tutorial Classes: Nil</b>			<b>Practical Classes: Nil</b>			<b>Total Classes: 12</b>
<p><b>OBJECTIVES:</b>  <b>The course should enable the students to:</b></p> <ol style="list-style-type: none"> <li>1. Improve communication skills</li> <li>2. Develop leadership qualities</li> </ol> <p>Professional Society Activities (PSA) course is aimed at enhancing the self-learning, communication, managerial skills of the students by engaging them in various Co &amp; Extra Curricular activities during their course of study. Activities in each of the department shall be designed and conducted by the Professional Society Executive Committee whose composition is:</p> <ol style="list-style-type: none"> <li>1. Faculty Mentors- 2 No.</li> <li>2. Student Chairman: 1 No.- Final year Student</li> <li>3. Student General Secretary: 1 No.- Third year Student</li> <li>4. Treasurer: 1 No.- Third year Student</li> </ol> <p>Student Members: 2 No's from each class            PSA related activities would be of the following nature but not limited to:</p>								
<b>Activity#1</b>	Just A Minute							
<b>Activity#2</b>	Technical Quiz							
<b>Activity#3</b>	Open House- Lab Demo							
<b>Activity#4</b>	Technical Paper Presentation- Preliminary							
<b>Activity#5</b>	Technical Paper Presentation- Final							
<b>Activity#6</b>	Poster Presentation							
<b>Activity#7</b>	Collage- A theme based event							
<b>Activity#8</b>	Debate Competition							
<b>Activity#9</b>	Group Discussion Competition							
<b>Activity#10</b>	Mock Interviews							
<b>Activity#11</b>	Model Exhibition							
<b>Activity#12</b>	Valedictory Function							

## COMMUNICATION SKILLS PRACTICE

<b>B.Tech IV Semester: Common to CE, EEE, ME, ECE &amp; CSE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
18AS402	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	-	-	-	-
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: 28</b>			<b>Total Classes: 28</b>			
<b>OBJECTIVES:</b>								
To convey or communicate the exact thought to express effectively with maximum efficiency								
<b>LIST OF ACTIVITIES</b>								
<b>ACTIVITY. 1</b>	<b>DEVELOPMENT OF PROFICIENCY IN CONCEPTS OF EFFECTIVE COMMUNICATION</b>							
Practice on Oral and spoken communication skill & testing– Communication process and voice & accent, voice clarity, handling them voice modulation & intonation, KISS (Keep it short and sweet) in word stress etc. Composing Feedback and questioning effective messages. Non–Verbal Communication: Objectiveness in Argument its importance and nuances: Development etiquettes and Facial Expression, Posture, manners Gesture , Eye contact, appearance Study of different pictorial (dress code).								
<b>ACTIVITY. 2</b>	<b>ART OF SPEAKING</b>							
Introduction – What makes communication important? – Defining communication – special feature of communication – communication process – channels of communication – Formal communications network – Informal communications network (Grapevine Communication) – Importance of Communication – Barriers to communication – Tips for effective communication – conversation tips – what is presentation? – Tips for powerful presentation – Art of public speaking – Importance of public speaking – Benefits of public speaking – Public speaking tips – overcoming fear of public speaking. <i>Activity : Conservation; Presentation; Pubic Speaking</i>								
<b>ACTIVITY. 3</b>	<b>ART OF WRITING</b>							
Introduction – Importance of Writing – Writing tips – Drawbacks of written communications								
<b>ACTIVITY. 4</b>	<b>ART OF WRITING E-MAIL</b>							
Introduction – The Mail Magic – use appropriate salutations – Make the subject matter significant – keep a dictionary close by – use commas – use smileys – when I doubt, preface – include previous message – shorten the file attachments – Reread before pressing ‘Send’ button –Be polite, and reciprocate good deeds – Anticipate, empathize, understand – what netiquette?								
<b>ACTIVITY. 5</b>	<b>ETIQUETTE AND MANNERS</b>							
<u>Etiquette</u> Introduction – Modern etiquette – Benefits of etiquette – classification of etiquette – accompanying women – Taboo topics – proposing the toast.								
<u>Manners</u> Introduction – Poor Manners noticed in youth – why should you practice good manners ? – Practicing good manners – Manners at the wheel driving – Manners in the flight – Respecting thesacred – visiting holy places – Dealing with the challenged – Attending the funeral – Professional manners – social skills (manners) – getting along with people – Manners to get respect from others – To sum up : corporate grooming tips – Mind your mobile manners – Annoying office habits.								

Activity : 1. Test your Etiquette; 2. Test your Manners

**ACTIVITY. 6      PREPARING CV / RESUME**

Introduction – Meaning – Differences among Bio-data, CV and Resume – The terms – The purpose of CV writing – Types of Resumes – Interesting facts about Resumes – CV writing tips – CV/Resume preparation – the do’s – Resume checkup – Electronic Resume tips – References – Power words – Common Resume builders – Key skills that can be mentioned in the Resume – Cover letters – Cover letter tips Expression of non-verbal communication and its analysis

**ACTIVITY. 7      WRITTEN COMMUNICATION SKILL**

Practice for:  
· Correction of errors  
· Making of Sentences  
· Paragraph Writing  
· Leave Application and simple letter writing

**ACTIVITY. 8      PRESENTATION SKILL PRACTICE**

· Preparing in presentation  
· Delivery of presentation

**ACTIVITY. 9      TELECOMMUNICATION SKILLS**

· Tele – etiquette  
· Receiving Calls  
· Transferring calls  
· Taking Message/ Voice Mails  
· Making Outgoing Calls

**ACTIVITY. 10      COMPUTER AND INTERNET OPERATIONAL**

· Key boarding skills  
· Practice on computer using MS office XP  
· Practice on sending & receiving e-mail

**Text Books:**

1. Soft skills Training – A workbook to develop skills for employment by Fredrick H. Wentz
2. Personality Development and Soft skills, Oxford University Press by Barun K. Mitra
3. The Time Trap : the Classic book on Time Management by R. Alec Mackenzie

**Reference Books:**

1. Ajmani, J. C. Good English: Getting it Right. New Delhi: Rupa Publications, 2012.
2. Bovee, Courtland L, John V. Thill & Barbara E. Schatzman. Business Communication Today: Tenth Edition. New Jersey: Prentice Hall, 2010.

**Web References:**

1. <http://networketiquette.net/>
2. <https://public.wsu.edu/~brians/errors/>

**Outcomes:**

1. Students will demonstrate competency in communication skills related to production and presentation of messages in multiple formats.
2. Students will demonstrate competency in critical thinking skills related to the analysis, interpretation, and criticism of messages.
3. Students will demonstrate competency in skills related to the construction and analysis of

argumentation and persuasive discourse.

4. Students will demonstrate an understanding of multiple theoretical perspectives and diverse intellectual traditions in Communication.
5. Students will demonstrate competency in human relational interaction.
6. Students will demonstrate competency in the analysis and practice of ethical communication.
7. Students will demonstrate an understanding of the importance of free expression and the responsibilities it entails.
8. Students will demonstrate competency in effective communication with diverse others and an understanding of the impact of culture on communication.

<b>B. Tech V Semester: Electronics and communication Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EC509	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: 60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: -</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
1. Learn about Analyze single and Multi stage amplifiers at low and High frequencies using BJT and FETs.								
2. Know about the design and importance of feedback in amplifiers in practical applications.								
3. Know about the principle, operation and design of oscillators.								
4. Learn about the design of Differentiator and Integrator circuits, clippers.								
<b>UNIT-I</b>	<b>SINGLE STAGE AMPLIFIERS DESIGN AND ANALYSIS</b>						<b>CLASSES:20</b>	
Review of CE, CB, CC& CS amplifiers Classification of Amplifiers, Distortion in amplifiers- Approximate analysis, CE, CB, CC amplifiers comparison. <b>BJT &amp; FET Frequency Response:</b> Logarithms-Decibels-General frequency consideration Low frequency analysis-Low frequency response of BJT amplifiers-Low frequency response of FET amplifier-Miller effect capacitance-High frequency response of BJT amplifier-Square wave testing								
<b>UNIT-II</b>	<b>FEEDBACK AMPLIFIERS</b>						<b>CLASSES:10</b>	
Concept of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on Amplifier characteristics Voltage series-Voltage shunt, Current series and Current shunt Feedback configurations Simple problems. <b>Oscillators:</b> Conditions for oscillations. RC and LC type Oscillators, Crystal oscillators, Frequency and amplitude stability of oscillators, Generalized analysis of LC oscillators, Quartz, Hartley, and Colpitts Oscillators, RC-phase shift and Wien-bridge oscillators.								
<b>UNIT-III</b>	<b>LARGE SIGNAL AMPLIFIERS</b>						<b>CLASSES:10</b>	
Class -A Power Amplifier, Maximum Value of Efficiency of Class A Amplifier, and Transformer coupled amplifier- Push Pull Amplifier-Complimentary Symmetry Circuits (Transformer Less Class B Power Amplifier)-Phase Inverters, Transistor Power Dissipation, Thermal Runway, Heat sinks.								
<b>UNIT-IV</b>	<b>LINEAR WAVESHAPING</b>						<b>CLASSES:10</b>	
High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. <b>Clippers and Clampers :</b> Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.								
<b>UNIT-V</b>	<b>SWITCHING CHARACTERISTICS OF DEVICES</b>						<b>CLASSES:10</b>	
Diode as a switch, piecewise linear diode characteristics, Transistor as a switch, Breakdown voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times. Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors.								
<b>Text Books:</b>								
1. Robert L.Boylestad, Louis Nasheisky, Electronic Devices and Circuit Theory, 9thed., Pearson Education ,2007.								
2. S. Salivahanan, N. Suresh Kumar and A. VallavaraJ, Electronic Devices and Circuits, 2nd ed.,								

TMH, 2008.

3. David A. Bell, Solid State Pulse Circuits, 4th ed., PHI, 2002.

**Reference Books:**

1. Robert r. Paynter, Introductory Electronic Devices and Circuits, 7th ed., PEI, 2009.
2. Anil K. Maini, Varsha Agrawal, Electronic Devices and Circuits, 1st ed., WILEY, 2009.
3. Jacob Milliman, Harbert Taub and Mothkl S Prakashrao, Pulse, Digital & Switching Waveforms, 2nd ed., TMH, 2008.

**Web References:**

1. [https://swayam.gov.in/nd1\\_noc20\\_ee45/preview](https://swayam.gov.in/nd1_noc20_ee45/preview)
2. <https://nptel.ac.in/courses/108/102/108102095/>
3. <https://circuitdigest.com/analog-electronics>

**E-Text Books:**

1. <https://www.pdfdrive.com/analog-electronics-books.html>
2. [https://books.google.co.in/books/about/Analog\\_Electronic\\_Circuits.html?id=EtTTXijkx98C](https://books.google.co.in/books/about/Analog_Electronic_Circuits.html?id=EtTTXijkx98C)

**Outcomes:**

At the end of the course students able to

1. Analyze Single stage amplifier at low and High frequencies using BJT and FETs.
2. Analyze Multi stage amplifiers at low and High frequencies using BJT and FETs.
3. Recognize the design and importance of feedback in amplifiers in practical applications.
4. Understand the principle, operation and design of oscillators.
5. Comprehend the use of Power amplifiers and Tuned amplifiers in real time applications
6. Learn the design of Differentiator and Integrator circuits, clippers, multivibrators

<b>B. Tech V Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE501	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: 65</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: -</b>			<b>Total Classes: 65</b>			

<b>OBJECTIVES</b>		
The course should enable the students to:		
1. To learn different power semiconductor devices.		
2. To learn different methods to turn on Power semiconductor devices.		
3. To learn different converter topologies, their operation and applications.		
<b>UNIT-I</b>	<b>POWER SEMICONDUCTOR DEVICES AND GATE TRIGGERING</b>	<b>CLASSES:15</b>
<p><b>Power Semiconductor Devices:</b> Study of switching devices - SCR, TRIAC, BJT, MOSFET, IGBT and GTO. Static and dynamic characteristics of SCR – Turn on and Turn off methods.</p> <p><b>Devices and circuits for triggering and commutation:</b> R, RC and UJT Triggering circuits for SCR, line and forced commutation circuits, gate drive circuits for MOSFET&amp;IGBT – Series and parallel operation of SCR.</p>		
<b>UNIT-II</b>	<b>SINGLE PHASE CONTROLLED RECTIFIER, THREE PHASE CONTROLLED RECTIFIER</b>	<b>CLASSES:15</b>
<p><b>Single Phase Controlled Rectifier:</b> Phase control technique: Halfwave, half &amp; full controlled rectifiers–midpoint &amp; bridge connections–Two pulse converter with Resistive, R-L and R-L-E loads – Derivation of average load voltage and current &amp; RMS Value – Active and Reactive power inputs to the converters with and without Freewheeling Diode - Effect of source inductance. Three pulse and six pulse rectifiers midpoint &amp; bridge connections – average load voltages with R and RL loads–Effect of Source inductance–Dual converter–Waveforms–Problems.</p>		
<b>UNIT-III</b>	<b>AC VOLTAGE CONTROLLERS AND CYCLO CONVERTERS</b>	<b>CLASSES:15</b>
<p>Single phase AC Regulators with R and RL loads, modes of operation of TRIAC, AC voltage Regulators Control strategies – Derivation of RMS load voltage, current and power factor, wave forms. Single phase midpoint cyclo-converters with Resistive and inductive load (Principle of operation only)–Bridge configuration of single phase cyclo-converter (Principle of operation only) – Waveforms.</p>		
<b>UNIT-IV</b>	<b>CHOPPERS</b>	<b>CLASSES:10</b>
<p>Choppers classification and their control strategy–Stepdown choppers, Derivation of load voltage and currents with R, RL and RLE loads. Stepup Chopper–load voltage expression. Buck-Boost converter Load commutated chopper, DC Jones chopper, problems.</p>		
<b>UNIT-V</b>	<b>INVERTERS</b>	<b>CLASSES:10</b>

Basic series and parallel inverter – Single phase and three phase bridge inverters–voltage source inverters–Current source inverter. Pulse Width Modulation techniques–Introduction to multilevel inverters concept –problems.

### **Text Books:**

1. Power Electronics – by P.S.Bhimbra “Power Electronics”, Khanna Publishers, 3rd Edition, 2003.
2. M. D. Singh & K. B. Kanchandhani, “Power Electronics”, Tata Mc Graw – Hill . Publishing Company, 1998.
3. “M. H. Rashid”, “Power Electronics : Circuits, Devices and Applications”, Prentice Hall of India, 2nd edition, 1998

### **Reference Books:**

1. Power Electronics: converters, applications & design -by Nedmohan, Tore M.Undeland, Robbins by Wiley India Pvt. Ltd
2. Elements of Power Electronics–Philip T.Krein.oxford.
3. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M.K.Sinha, New Age International (P) Limited Publishers, 1996.

### **Web References**

1. <https://www.researchgate.net>
2. <https://www.aar.faculty.asu.edu/CLASSES>
3. <https://www.facstaff.bucknell.edu/>
4. <https://www.electrical4u.com>

### **E-Text Books**

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

### **Outcomes:**

At the end of the course students able to

1. Understand the basics of Power Electronics.
2. Learn the details of power semiconductor switches (Construction, Characteristics and operation).
3. Understand the working of various types of converters
4. Learn how to analyze the converters and design the components of them, under various load types.
5. Learn about the control of various converters.
6. Understand the working of various types of choppers

## TRANSMISSION AND DISTRIBUTION OF ELECTRICAL POWER

<b>B. Tech V Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE502</b>	<b>EEE</b>	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: 65</b>		<b>Tutorial Classes:-</b>		<b>Practical CLASSES:-</b>		<b>Total Classes: 65</b>		

<b>OBJECTIVES</b>		
<p><b>The course should enable the students to</b></p> <ol style="list-style-type: none"> <li>1. To acquire knowledge on Transmission line parameters and their calculation for various configurations of transmission lines.</li> <li>2. To gain adequate knowledge on performance specifications of Transmission lines such as regulation and efficiency for various models of lines.</li> <li>3. To study the Corona phenomenon and Sag and Tension calculations.</li> <li>4. To give an idea about the fundamental concepts of electrical power distribution, both AC &amp; DC</li> </ol>		
<b>UNIT-I</b>	<b>TRANSMISSION LINE PARAMETERS</b>	<b>CLASSES:15</b>
Types of conductors –Calculation of Resistance- Skin and Proximity effect-Calculation of Inductance of single phase, Three phase line with symmetrical and unsymmetrical spacing, Single and double circuits-Concept of GMR and GMD- -Numerical Problems- Calculation of capacitance of single phase, Three phase line with symmetrical and unsymmetrical spacing, Single and double circuits.		
<b>UNIT-II</b>	<b>PERFORMANCE OF TRANSMISSION LINES</b>	<b>CLASSES:15</b>
Classification and Representation of Transmission lines-Short Transmission line-Medium Transmission line: End condenser, Nominal T and Nominal $\Pi$ methods- Long Transmission lines-Rigorous Method-ABCD constants of Transmission lines-Calculation of voltage regulation and efficiency-Numerical Problems- Ferranti effect-Surge impedance and Surge Impedance Loading.		
<b>UNIT-III</b>	<b>CORONA AND SAG-TENSION CALCULATIONS</b>	<b>CLASSES:15</b>
Corona phenomena-factors affecting corona-Critical voltages and Power loss-Numerical Problems-Methods of reducing corona-Radio Interference. Factors affecting sag-Calculation of sag and Tension with equal and unequal heights of towers, effect of wind and Ice on sag- Numerical Problems-Stringing chart and Sag Template.		
<b>UNIT-IV</b>	<b>INSULATORS AND CABLES</b>	<b>CLASSES:10</b>
Types of insulators-Potential distribution over suspension Insulator String-String efficiency-Methods of improving String efficiency-Numerical Problems. Construction of cables-Insulating materials –Types of cables-Insulation resistance of single core cable- Capacitance of single and three core cable-Dielectric stress in a single core cable-Grading of cables- Numerical Problems.		
<b>UNIT-V</b>	<b>DISTRIBUTION SYSTEMS</b>	<b>CLASSES:10</b>
Classification-Methods of 3 wire DC system-Radial and Ring Distribution systems-DC Distribution with concentration loads and uniform loading-AC Distribution-Numerical Problems.		
<b>Text Books:</b>		

1. Wadhwa.C.L, Electrical power systems, New Age International (P) Limited, Publishers, 6<sup>th</sup> Edition, 2010.
2. Grainger and Stevenson, "Power System Analysis", Tata McGraw-Hill, 3rd Edition, 2011.

#### Reference Books:

1. Gupta B.R, Power System Analysis and Design, S. Chand & Co, 6<sup>th</sup> Revised Edition, 2010.
2. Nagarath I.J and Kothari D.P, Modern Power System Analysis, Tata McGraw Hill, 9<sup>th</sup> Reprint Edition, 2007.
3. Rajput R. K, Power System Engineering, Laxmi Publications, 1<sup>st</sup> Edition, 2006.
4. Soni M.L, Gupta P.V, Bhatnagar U.S, Chakrabarthy.A, A Text Book on Power System Engineering, Dhanpat Rai & Co Pvt. Ltd, 2<sup>nd</sup> Edition, 2009.

#### Web References:

1. [https://www.en.wikipedia.org/wiki/Electric\\_power\\_transmission](https://www.en.wikipedia.org/wiki/Electric_power_transmission)
2. <https://www.iec.ch/about/brochures/pdf/technology/transmission.pdf>
3. <https://www.teriin.org/upfiles/pub/papers/ft33.pdf>
4. [https://www.energy.gov/sites/prod/files/2015/09/f26/QTR2015-3F-Transmission-and-Distribution\\_1.pdf](https://www.energy.gov/sites/prod/files/2015/09/f26/QTR2015-3F-Transmission-and-Distribution_1.pdf)

#### E-Text Books:

1. [https://www.jfgieras.com/Grigsby\\_Chapter\\_34\\_LEM.pdf](https://www.jfgieras.com/Grigsby_Chapter_34_LEM.pdf)
2. <https://www.personal.psu.edu/sab51/vls/vonmeier.pdf>
3. [https://www.edsonjosen.dominiotemporario.com/doc/Livro\\_Electric\\_Power\\_Distribution\\_System\\_Engineering\\_-\\_Turan\\_Gonen.pdf](https://www.edsonjosen.dominiotemporario.com/doc/Livro_Electric_Power_Distribution_System_Engineering_-_Turan_Gonen.pdf)

#### Outcomes:

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

1. Determine the transmission line parameters for various configurations.
2. Analyze the performance of different types of transmission lines.
3. Analyze different types of transients occurring in transmission lines and also corona effect.
4. To Calculate string efficiency of overhead line insulators and improve the same
5. Calculate the sag and tension in electric towers and select suitable cable.
6. Understand the general aspects of D.C and A.C distribution system.

## CONTROL SYSTEMS

<b>B. Tech V Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE503</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:70</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes: -</b>		<b>Total Classes: 70</b>		

### OBJECTIVES

**The course should enable the students to:**

1. Organize modeling and analysis of electrical and mechanical systems.
2. Analyze control systems by block diagrams and signal flow graph technique.
3. Demonstrate the analytical and graphical techniques to study the stability.
4. Illustrate the frequency domain and state space analysis.

<b>UNIT-I</b>	<b>MATHEMATICAL MODELING OF SYSTEMS</b>	<b>CLASSES:20</b>
---------------	---	-------------------

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, transfer function of armature control and field control of DC motor, AC servomotor. Transfer function - Block diagram reduction techniques, signal flow graph.

<b>UNIT-II</b>	<b>TIME RESPONSE AND STABILITY ANALYSIS</b>	<b>CLASSES:15</b>
----------------	---	-------------------

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. Routh-Hurwitz stability criterion, Root locus technique- root locus diagram, rules to construct root loci, effect of pole zero additions on the root loci.

<b>UNIT-III</b>	<b>FREQUENCY DOMAIN ANALYSIS</b>	<b>CLASSES:15</b>
-----------------	----------------------------------	-------------------

Introduction, frequency domain specifications, stability analysis from Bode plot, Polar plot, Nyquist plot, calculation of gain margin and phase margin, determination of transfer function.

<b>UNIT-IV</b>	<b>CONTROLLERS AND COMPENSATORS</b>	<b>CLASSES:10</b>
----------------	-------------------------------------	-------------------

Introduction to controllers, effect of P, PI and PID controllers. Compensators - lag, lead, lead-lag compensator design using Bode plot.

<b>UNIT-V</b>	<b>STATE SPACE ANALYSIS</b>	<b>CLASSES: 10</b>
---------------	-----------------------------	--------------------

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.

#### Text Books

1. I J Nagrath, M Gopal, "Control Systems Engineering", New Age International Publications, 3<sup>rd</sup> Edition, 2007.
2. K Ogata, "Modern Control Engineering", Prentice Hall, 4<sup>th</sup> Edition, 2003.
3. Control Systems Engineering, 6ed, ISV (WSE) by "NISE" Wiley publications.

#### Reference Books

1. Anand Kumar, "Control Systems", PHI Learning, 1<sup>st</sup> Edition, 2007.

2. S Palani, "Control Systems Engineering", Tata McGraw-Hill Publications, 1<sup>st</sup> Edition, 2001.
3. N K Sinha, "Control Systems", New Age International Publishers, 1<sup>st</sup> Edition, 2002.
4. A. Nagoorkani, Control Systems, RBA Publications, 2nd edition, 2006.

#### **Web References**

1. <https://www.researchgate.net>
2. <https://www.aar.faculty.asu.edu/CLASSES>
3. <https://www.facstaff.bucknell.edu/>
4. <https://www.electrical4u.com>
5. <https://www.iare.ac.in>

#### **E-Text Books**

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

#### **Outcomes:**

At the end of the course students able to

1. Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form.
2. Characterize any system in Laplace domain to illustrate different specification of the system using transfer function concept.
3. Interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis.
4. Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.
5. Formulate different types of analysis in frequency domain to explain the nature of stability of the system.
6. Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system

## ELECTRICAL MACHINES-III

<b>B. Tech V Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE504</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:65</b>	<b>Tutorial Classes: 2</b>	<b>Practical Classes: -</b>			<b>Total Classes: 67</b>			

<b>OBJECTIVES</b>		
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> <li>1. To discuss e.m.f generation principle of synchronous generator and armature reaction effect.</li> <li>2. Illustrate the effect of harmonics on the performance of synchronous generators.</li> <li>3. To study the effect of load at different power factors, methods of predetermination of regulation for non-salient and salient pole generators.</li> <li>4. To study the parallel operation and the concepts of transfer of real and reactive powers.</li> <li>5. To understand the operation and performance of synchronous motor.</li> <li>6. To study the power circle diagrams and methods of starting of synchronous motor.</li> </ol>		
<b>UNIT-I</b>	<b>CONSTRUCTION AND OPERATION OF SYNCHRONOUS GENERATORS AND VOLTAGE REGULATION</b>	<b>CLASSES:15</b>
<p>Construction, EMF equation with sinusoidal flux, winding factors, harmonics in generated voltage and their suppression, armature leakage flux, armature reaction, synchronous impedance, vector diagram, load characteristics.</p> <p>Voltage regulation- methods of determining regulation – direct load, EMF, MMF, ZPF and ASA, losses and efficiency. slip test, regulation of salient pole machines</p>		
<b>UNIT-II</b>	<b>PARALLEL OPERATION OF SYNCHRONOUS GENERATORS</b>	<b>CLASSES:15</b>
<p>Parallel operation, synchronizing with infinite bus bars, synchronizing current, synchronizing power, expression for power, power angle characteristics, Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactances, effect of variation of excitation and mechanical input on parallel operation, load sharing. Applications of Synchronous generators.</p>		
<b>UNIT-III</b>	<b>SYNCHRONOUS MOTORS</b>	<b>CLASSES:12</b>
<p>Theory of operation, starting methods, Phasor diagrams, variation of current and power factor with excitation - minimum and maximum power for a given excitation and power circles, V and inverted V curves, hunting – its prevention, synchronous condenser and its application. Applications of synchronous motors.</p>		
<b>UNIT-IV</b>	<b>SPECIAL MACHINES</b>	<b>CLASSES:13</b>

Constructional features – Principle of operation and Characteristics of Hysteresis motor-Synchronous Reluctance Motor-Linear Induction motor-Repulsion motor- Stepper motors- - Variable reluctance stepper motor -Applications.

<b>UNIT-V</b>	<b>PERMANENT MAGNET BRUSHLESS D.C. MOTORS</b>	<b>CLASSES:10</b>
---------------	---	-------------------

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Power Converter Circuits and their controllers -Characteristics and control-Applications.

**Text Books:**

1. Theory and Performance of Electrical Machines by JB Gupta, Katson Publications
2. Electric Machines by D.P.Nagarath & I.J.Kothari 7/E TMH-2005
3. Special Electric Machines by K.Venkataratnam, Universities Press, 15-Apr-2009 - Technology & Engineering

**Reference Books:**

1. Electrical Machines by P.S.Bimbra, khanna Publishers
2. Electrical Machinery by Fitzgerald, Kingsley and S.D.Umans (5th Ed),MGH

**Web References:**

1. <https://www.researchgate.net>
2. <https://www.aar.faculty.asu.edu/CLASSES>
3. <https://www.facstaff.bucknell.edu/>
4. <https://www.electrical4u.com>
5. <https://www.iare.ac.in>

**E-Text Books:**

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

**Outcomes:**

At the end of the course students able to

1. Acquire knowledge about the constructional details and principle of operation of alternators.
2. Acquire knowledge about the working of synchronous machines as generators and motors.
3. Acquire knowledge about testing and applications of synchronous machines
4. Acquire knowledge about the constructional details and principle of operation of three phase and single phase induction motors
5. Acquire knowledge about the starting and speed control of induction motors
6. Acquire knowledge about testing and applications of induction motors

## POWER QUALITY (OPEN ELECTIVE-I)

<b>B. Tech V Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE505	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: 60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: -</b>			<b>Total Classes: 60</b>			

### OBJECTIVES

The course should enable the students to:

1. Assess the severity of power quality problems in power system.
2. Analyze voltage sag problems and suggest preventive techniques.
3. Understand the effect of harmonics on power system
4. Understand the basic principles of measuring instruments

<b>UNIT-I</b>	<b>POWER QUALITY - AN OVERVIEW</b>	<b>CLASSES:10</b>
Power Quality definition, PQ characterization: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power Quality Terms, CBEMA and ITI Curves		
<b>UNIT-II</b>	<b>VOLTAGE SAGS AND INTERRUPTIONS</b>	<b>CLASSES:10</b>
Sources of sags and Interruptions. Estimating Voltage sag performance—Area of vulnerability, equipment sensitivity to voltage sags, transmission system sag performance evaluation, Utility Distribution system sag performance evaluation. Fundamental Principles of Protection. Solutions at the end-user level. Evaluating the economics of different Ride-through Alternatives. Motor- Starting Sags.		
<b>UNIT-III</b>	<b>FUNDAMENTALS OF HARMONICS</b>	<b>CLASSES:15</b>
Harmonic distortion. Voltage versus Current distortion. Harmonics versus Transients. Harmonic indexes .Harmonic sources from commercial loads. Harmonic sources from industrial loads. Locating Harmonic sources. System response characteristics. Effects of Harmonic Distortion.		
<b>UNIT-IV</b>	<b>DISTRIBUTED GENERATION AND POWER QUALITY</b>	<b>CLASSES:10</b>
Resurgence of DG. DG Technologies. Interface to the Utility System. Power Quality issues. Operating conflicts. DG on distribution Networks. Sitting DG distributed Generation, Interconnection standards.		
<b>UNIT-V</b>	<b>WIRING, GROUNDING AND POWER QUALITY MONITORING</b>	<b>CLASSES:15</b>
<p><b>Wiring and Grounding:</b> Definitions, Reasons for Grounding, Typical Wiring and Grounding Problems, Solutions to Wiring and Grounding Problems</p> <p><b>Power Quality Monitoring:</b> Monitoring Consideration. Historical perspective of power quality measuring instruments. Power quality measurement equipment</p>		

**Text Books:**

1. Electrical Power Systems Quality: Roger C. Dugan, MF McGranaghan, Surya Santoso and HW Beaty, TMH, 2/E
2. Jos Arrillaga, Neville R. Watson, "Power System Harmonics"- John Wiley & Sons, 2003

**Reference Books:**

1. Math H.J.Bollen, "Understanding Power Quality Problems-Voltage sag & Interruptions", IEEE Press, 2000
2. G.T.Heydt, "Electric Power Quality", Stars in a Circle Publications, 1994(2nd edition)

**Web References:**

1. <https://nptel.ac.in/courses/108/106/108106025/>
2. <https://nptel.ac.in/courses/108/107/108107157/>

**E-Text Books:**

1. [https://books.google.co.in/books/about/Power\\_Quality.html?id=ePbLBQAAQBAJ&redir\\_esc=y](https://books.google.co.in/books/about/Power_Quality.html?id=ePbLBQAAQBAJ&redir_esc=y)
2. [http://www.gcebargur.ac.in/sites/gcebargur.ac.in/files/lectures\\_desk/electrical\\_power\\_systems\\_quality.pdf](http://www.gcebargur.ac.in/sites/gcebargur.ac.in/files/lectures_desk/electrical_power_systems_quality.pdf)

**Outcomes:**

At the end of the course students able to

1. Understand the term and definition of power quality disturbances, and their causes, detrimental effects and solutions.
2. Understand the causes of power quality problems and relate them to equipment.
3. Introduce the harmonic sources, passive filters, active filters and standards.
4. know the power quality monitoring method, equipments and develop the ability to analyze the measured data
5. Study the interruptions types and its influence in various components.
6. Understand power quality monitoring and classification techniques.

## ENERGY AUDITING AND DEMAND SIDE MANAGEMENT (OPEN ELECTIVE-I)

<b>B. Tech V Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE506</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:60</b>		<b>Tutorial Classes:-</b>		<b>Practical CLASSES:-</b>		<b>Total Classes: 60</b>		

### OBJECTIVES

The course should enable the students to:

1. This subject deals with the energy auditing, conservation, management techniques, and measurements in energy audits. Information about how to improve the power factor & efficiency of electrical equipment.
2. To deals with DSM programme to improve financial performance and customer relations.

<b>UNIT-I</b>	<b>INTRODUCTION AND BASIC PRINCIPLES OF ENERGY AUDIT: INTRODUCTION</b>	<b>CLASSES:15</b>
---------------	--	-------------------

**Introduction and Basic Principles of Energy Audit: Introduction** - Energy situation – world and India, energy consumption, conservation **Energy audit**- definitions, concept, types of audit, energy index, cost index ,pie charts, Sankey diagrams, load profiles, Energy conservation schemes, Measurements in energy audits, presentation of energy audit results.

<b>UNIT-II</b>	<b>ENERGY EFFICIENT MOTORS AND POWER FACTOR IMPROVEMENT</b>	<b>CLASSES:15</b>
----------------	---	-------------------

**Energy Efficient Motors and Power Factor Improvement:** Energy efficient motors , factors affecting efficiency, loss distribution , constructional details , characteristics - variable speed , variable duty cycle systems, MS hp- voltage variation-voltage unbalance- over motoring- motor energy audit.

**Power factor – methods of improvement:** location of capacitors, Pf with nonlinear loads, effect of harmonics on power factor, power factor motor controllers.

<b>UNIT-III</b>	<b>LIGHTING , ENERGY INSTRUMENTS AND</b>	<b>CLASSES:10</b>
-----------------	--	-------------------

**Lighting , Energy Instruments and Economic Aspects:** Good lighting system design and practice, lighting control ,lighting energy audit – Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, application of PLC's.

<b>UNIT-IV</b>	<b>ENERGY EFFICIENCY IN ECONOMIC ASPECTS</b>	<b>CLASSES:10</b>
----------------	--	-------------------

**Economics Analysis:** Methods, life cycle costing analysis, time value of money, rate of return, present worth method - problems.

<b>UNIT-V</b>	<b>DEMAND SIDE MANAGEMENT</b>	<b>CLASSES:10</b>
---------------	-------------------------------	-------------------

**Demand Side Management:** Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM, Load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and Organization of Energy Conservation awareness Programs

**Text Books:**

1. Energy management by W.R. Murphy AND G. McKay Butter worth, Heinemann publications. 1982.
2. Demand Side Management, Jyothi Prakash, TMH Publishers. 1977.

**Reference Books:**

1. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995.
2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998.

**Web References:**

1. <https://www.nptel.ac.in/syllabus/108103008/>
2. <https://www.sciencedirect.com/science/book/9780123744982>
3. <https://www.springer.com/us/book/9781846280559>

**E-Text Books:**

1. <https://www.nptel.ac.in/courses/108103008/>
2. <https://www.freeengineeringbooks.com>
3. <https://www.engr.mun.ca/~hinch/6951/TEXT/DORF.PDF>

**Outcomes:**

At the end of the course students able to

1. Apply the knowledge of the subject to calculate the efficiency of various thermal utilities.
2. Design suitable energy monitoring system to analyze and optimize the energy consumption in an organization.
3. Improve the thermal efficiency by designing suitable systems for heat recovery and co-generation.
4. Use the energy audit methods learnt to identify the areas deserving tighter control to save energy expenditure.
5. Carry out the cost- benefit analysis of various investment alternatives for meeting the energy needs of the organization.
6. Guide the employees of the organization about the need and the methods of energy conservation.

## POWER PLANT ENGINEERING (OPEN ELECTIVE-I)

<b>B. Tech V Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE507</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes: 60</b>		<b>Tutorial Classes: -</b>		<b>Practical CLASSES:-</b>		<b>Total Classes: 60</b>		

### OBJECTIVES

1. To introduce students to different aspects of power plant engineering.
2. To familiarize the students to the working of power plants based on different fuels.
3. To expose the students to the principles of safety and environmental issues.

<b>UNIT-I</b>	<b>INTRODUCTION TO THE SOURCES OF ENERGY</b>	<b>CLASSES:14</b>
Introduction: Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant. Power plant economics and selection		
<b>UNIT-II</b>	<b>STEAM POWER PLANT</b>	<b>CLASSES:12</b>
Plant Layout, Working of different Circuits, Fuel and handling equipment, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems. Combustion Process: Properties of coal — overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and drought system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.		
<b>UNIT-III</b>	<b>DIESEL POWER PLANT</b>	<b>CLASSES:12</b>
Internal Combustion Engine Plant: DIESEL POWER PLANT: Introduction — IC Engines, types, construction— Plant layout with auxiliaries — fuel supply system, air starting equipment, lubrication and cooling system — super charging. Gas Turbine Plant: Introduction — classification – construction — Layout with auxiliaries — Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison. Direct Energy Conversion: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.		
<b>UNIT-IV</b>	<b>HYDRO ELECTRIC POWER PLANT</b>	<b>CLASSES:12</b>
Water power — Hydro logical cycle / flow measurement — drainage area characteristics — Hydro graphs — storage and Poundage — classification of dams and spill ways. Hydro Projects And Plant: Classification — Typical layouts — plant auxiliaries — plant operation pumped storage plants. Power From Non-Conventional Sources: Utilization of Solar- Collectors- Principle of Working, Wind Energy — types — HAWT, VAWT Tidal Energy.		

UNIT-V	SOLAR AND WIND ENERGY	CLASSES:10
<p><b>Solar Energy:</b> Introduction, The Sun as Source of Energy, The Earth, Sun, Earth Radiation Spectrum, Extraterrestrial and Terrestrial Radiations, Spectral Power Distribution of Solar Radiation, Depletion of Solar Radiation.</p>		
<p><b>Wind Energy:</b> Introduction, Basic Principles of Wind Energy Conversion, History of Wind Energy, Wind Energy Scenario – World and India. The Nature of the Wind, The Power in the Wind, Forces on the Blades, Wind Energy Conversion, Wind Data and Energy Estimation, Site Selection Considerations</p>		
<p><b>Text Books:</b></p>		
<ol style="list-style-type: none"> <li>1. Power Plant Engineering! P.C.Sharma / S.K.Kataria Pub.</li> <li>2. A Course in Power Plant Engineering: I Arora and S. Domkundwar.</li> </ol>		
<p><b>Reference Books:</b></p>		
<ol style="list-style-type: none"> <li>1. A Text Book of Power Plant Engineering I Rajput I Laxmi Publications.</li> <li>2. Power Plant Engineering: P.K.Nag/ II Edition /TMH.</li> <li>3. An Introduction to Power Plant Technology I G.D. Rai/Khanna Publishers.</li> <li>4. Power plant Engg I Elanchezhian/ I.K. International Pub.</li> <li>5. Power plant Engineering! Ramalingam / Scietech Publishers.</li> </ol>		
<p><b>Web References</b></p>		
<ol style="list-style-type: none"> <li>1. <a href="https://www.researchgate.net">https://www.researchgate.net</a></li> <li>2. <a href="https://www.facstaff.bucknell.edu/">https://www.facstaff.bucknell.edu/</a></li> <li>3. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a></li> </ol>		
<p><b>Outcomes:</b> At the end of the course students able to</p> <ol style="list-style-type: none"> <li>1. Describe and analyze different types of sources and mathematical expressions related to thermodynamics and various terms and factors involved with power plant operation.</li> <li>2. Analyze the working and layout of steam power plants and the different systems comprising the plant and discuss about its economic and safety impacts.</li> <li>3. Combine concepts of previously learnt courses to define the working principle of diesel power plant, its layout, safety principles and compare it with plants of other types.</li> <li>4. Describe the working principle and basic components of the nuclear power plant and the economic and safety principles involved with it.</li> <li>5. Discuss the working principle and basic components of the hydro electric plants and the economic principles and safety precautions involved with it.</li> <li>6. Discuss and analyze the mathematical and working principles of different electrical equipments involved in the generation of power.</li> </ol>		

## ANALOG ELECTRONICS LAB

<b>B. Tech V Semester: Electronics and communication Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EC514</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>25</b>	<b>50</b>	<b>75</b>
<b>Contact Classes:-</b>	<b>Tutorial Classes: -</b>		<b>Practical CLASSES:39</b>			<b>Total Classes: 39</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
1. Generation and processing of sinusoidal and non-sinusoidal signals								
2. Analysis and design of various multivibrator circuits								
3. Know about the design and importance of feedback in amplifiers in practical applications.								
4. Know about the principle, operation and design of oscillators.								
5. Learn about the design of Differentiator and Integrator circuits, clippers.								
<b>LIST OF EXPERIMENTS</b>								
<b>Expt. 1</b>	<b>LINEAR WAVE SHAPING.</b>							
To verify Linear wave-shaping characteristics								
<b>Expt. 2</b>	<b>NON LINEAR WAVE SHAPING-CLIPPERS.</b>							
To verify Non linear wave-shaping-clippers characteristics								
<b>Expt. 3</b>	<b>NON LINEAR WAVE SHAPING-CLAMPERS.</b>							
To verify Non linear wave-shaping-clampers characteristics								
<b>Expt. 5</b>	<b>TWO STAGE RC COUPLED AMPLIFIERS</b>							
To verify the characteristics of Two Stage RC Coupled Amplifiers								
<b>Expt. 6</b>	<b>CURRENT SHUNT FEEDBACK AMPLIFIER</b>							
To verify the characteristics of Current shunt Feedback Amplifier								
<b>Expt. 7</b>	<b>CLASS A POWER AMPLIFIER (TRANSFORMER LESS).</b>							
To verify the characteristics of Class A Power Amplifier (Transformer less)								
<b>Expt. 8</b>	<b>CLASS B COMPLEMENTARY SYMMETRY AMPLIFIER</b>							
To verify the characteristics of Class B Complementary Symmetry Amplifier								
<b>Expt. 9</b>	<b>ASTABLE MULTIVIBRATOR.</b>							
To verify Astable Multivibrator characteristics								
<b>Expt. 10</b>	<b>MONOSTABLE MULTIVIBRATOR.</b>							
To verify Mono-stable Multivibrator characteristics								
<b>Expt. 11</b>	<b>BISTABLE MULTIVIBRATOR</b>							

To verify B-istable Multivibrator characteristics	
<b>Expt. 12</b>	<b>SCHMITT TRIGGER.</b>
To verify Schmitt trigger characteristics	
<b>Expt. 13</b>	<b>UJT RELAXATION OSCILLATOR</b>
To verify UJT Relaxation oscillator characteristics	
<b>Expt. 14</b>	<b>COLPITTS OSCILLATOR</b>
To verify Colpitts oscillator characteristics	
<b>Expt. 15</b>	<b>RC- PHASE SHIFT OSCILLATOR.</b>
To verify RC- Phase shift oscillator characteristics	
<b>Reference Books:</b>	
1. P. S. Bhimbra, “Electrical Machinery”, Seventh Edition, 1995, Khanna Publisher	
2. P. K. Mukharjee, S Chakravarti, “Electric Machines”, Dhanpat Rai & Sons.	
<b>Web References:</b>	
1. <a href="https://circuitdigest.com/analog-electronics">https://circuitdigest.com/analog-electronics</a>	
<b>Outcomes:</b>	
At the end of the course students able to	
1. Design and analyze diode applications like Linear and non linear wave shaping.	
2. Design and analyze design of logic gates.	
3. Design and analyze Switching characteristics of diodes and transistors.	
4. Construct the circuits of Multivibrators and Schmitt trigger.	

## ELECTRICAL MACHINES LAB-II

<b>B. Tech V Semester– Electrical and Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>18EE508</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>25</b>	<b>50</b>	<b>75</b>
<b>Contact Classes:-</b>		<b>Tutorial Classes:-</b>		<b>Practical Classes: 39</b>			<b>Total Classes: 39</b>	

### OBJECTIVES

**The course should enable the students to:**

1. Evaluate losses and determine the efficiency of single phase and three phase electrical machines.
2. Determine the voltage regulation, efficiency and temperature rise in various transformers.
3. Apply PLC and digital simulation software to gain practical knowledge.

### LIST OF EXPERIMENTS

<b>Expt. 1</b>	<b>OC AND SC TEST ON SINGLE PHASE TRANSFORMER</b>
Determine the equivalent circuit parameters; predetermine the efficiency and regulation by open circuit and short circuit test on a single phase transformer.	
<b>Expt. 2</b>	<b>SUMPNER'S TEST</b>
Predetermine the efficiency and regulation of two identical single phase transformers.	
<b>Expt. 3</b>	<b>LOAD TEST ON SINGLE PHASE TRANSFORMERS</b>
Determination of efficiency by load test on a single phase transformer.	
<b>Expt. 4</b>	<b>SCOTT CONNECTION OF TRANSFORMERS</b>
Conversion of three phase to two phase using single phase transformers	
<b>Expt. 5</b>	<b>SEPARATION OF CORE LOSSES IN SINGLE PHASE TRANSFORMER</b>
Find out the eddy current and hysteresis losses in single phase transformer.	
<b>Expt. 6</b>	<b>HEAT RUN TEST ON SINGLE PHASE TRANSFORMERS</b>
Determine the temperature rise in three single phase transformers set.	
<b>Expt.7</b>	<b>BRAKE TEST ON THREE PHASE SQUIRREL CAGE INDUCTION MOTOR</b>
Plot the performance characteristics of three phase induction motor.	
<b>Expt. 8</b>	<b>CIRCLE DIAGRAM OF THREE PHASE SQUIRREL CAGE INDUCTION MOTOR</b>
Plot the circle diagram and predetermine the efficiency and losses of three phase squirrel cage induction motor	

<b>Expt. 9</b>	<b>REGULATION OF ALTERNATOR BY EMF METHOD</b>
Determine the regulation of alternator using synchronous impedance method.	
<b>Expt. 10</b>	<b>REGULATION OF ALTERNATOR BY MMF METHOD</b>
Determine the regulation of alternator using amperes turns method.	
<b>Expt. 11</b>	<b>SLIP TEST ON THREE PHASE SALIENT POLE SYNCHRONOUS MOTOR</b>
Determination of $X_d$ and $X_q$ in a three phase salient pole synchronous motor.	
<b>Expt. 12</b>	<b>V AND INVERTED V CURVES OF SYNCHRONOUS MOTOR</b>
Plot V and inverted V curves to study the effect of power factor in synchronous motor.	
<b>Expt. 13</b>	<b>EQUIVALENT CIRCUIT PARAMETERS OF SINGLE PHASE INDUCTION MOTOR</b>
Determine the equivalent circuit parameters of a single phase induction motor	
<b>Expt. 14</b>	<b>STARTING AND SPEED CONTROL OF INDUCTION MOTOR USING PLC</b>
Implementation of star-delta starter using PLC; Speed control of three phase slip ring induction motor with rotor resistance cutting using PLC.	
<b>Reference Books</b>	
1. P S Bimbhra, "Electrical Machines", Khanna Publishers, 2nd Edition, 2008.	
2. M V Deshpande, "Electrical Machines", PHI Learning Private Limited, 3rd Edition, 2011.	
3. R K Srivastava, "Electrical Machines", Cengage Learning, 2nd Edition, 2013.	
<b>Web References</b>	
1 <a href="https://www.ee.iitkgp.ac.in">https://www.ee.iitkgp.ac.in</a>	
2 <a href="https://www.citchennai.edu.in">https://www.citchennai.edu.in</a>	
3 <a href="https://www.iare.ac.in">https://www.iare.ac.in</a>	
<b>Outcomes:</b>	
At the end of the course students able to	
1. Acquire hands on experience of conducting various tests on alternators and obtaining their performance indices using standard analytical as well as graphical methods	
2. Acquire hands on experience of conducting various tests on induction machines and obtaining their performance indices using standard analytical as well as graphical methods	
3. Acquire hands on experience of conducting various tests on transformers	
4. Control the speed of three phase slip ring induction motor with rotor resistance cutting using PLC	

## CONTROL SYSTEMS LAB

<b>B. Tech V Semester – Electrical and Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
18EE509	Core	L	T	P	C	CIA	SEE	Total
		0	0	2	1	25	50	75
<b>Contact Classes:-</b>		<b>Tutorial Classes:-</b>		<b>Practical Classes: 39</b>			<b>Total Classes: 39</b>	

### OBJECTIVES

**The course should enable the students to:**

1. Understand mathematical models of electrical and mechanical systems.
2. Analysis of control system stability using digital simulation.
3. Demonstrate the time domain and frequency domain analysis for linear time invariant systems.
4. Apply programmable logic controllers to demonstrate industrial controls in the laboratory.

### LIST OF EXPERIMENTS

<b>Expt. 1</b>	<b>TIME RESPONSE OF SECOND ORDER SYSTEM</b>
----------------	---

To determine characteristics of time response of Second order system

<b>Expt. 2</b>	<b>CHARACTERISTICS OF SYNCHROS</b>
----------------	------------------------------------

To determine characteristics of Synchros

<b>Expt. 3</b>	<b>PROGRAMMABLE LOGIC CONTROLLER – STUDY AND VERIFICATION OF TRUTH TABLES OF LOGIC GATES, SIMPLE BOOLEAN EXPRESSIONS.</b>
----------------	---

To Study and verification of truth tables of logic gates, simple Boolean Expressions.

<b>Expt. 4</b>	<b>EFFECT OF FEEDBACK ON DC SERVO MOTOR</b>
----------------	---

To study effect of feedback on DC servo motor

<b>Expt. 5</b>	<b>CHARACTERISTICS OF AC SERVO MOTOR</b>
----------------	--

To determine Characteristics of AC servo motor

<b>Expt. 6</b>	<b>EFFECT OF P, PD, PI, PID CONTROLLER ON A SECOND ORDER SYSTEMS</b>
----------------	--

To study effect of P, PD, PI, PID Controller on a second order systems

<b>Expt.7</b>	<b>LAG AND LEAD COMPENSATION – MAGNITUDE AND PHASE PLOT</b>
---------------	---

To study Lag and lead compensation – Magnitude and phase plot

<b>Expt. 8</b>	<b>TRANSFER FUNCTION OF DC GENERATOR</b>
----------------	--

To determine Transfer function of DC generator

<b>Expt. 9</b>	<b>TEMPERATURE CONTROLLER USING PID</b>
To study temperature controller using PID	
<b>Expt. 10</b>	<b>CHARACTERISTICS OF MAGNETIC AMPLIFIERS</b>
To determine Characteristics of magnetic amplifiers	
<b>Expt. 11</b>	<b>VERIFICATION OF CONTROLLABILITY AND OBSERVABILITY OF THE SYSTEM</b>
To study Controllability and Observability of the system using MATLAB	
<b>Expt. 12</b>	<b>LINEAR SYSTEM ANALYSIS (TIME DOMAIN ANALYSIS, ERROR ANALYSIS)</b>
To perform Linear system analysis (Time domain analysis, Error analysis)using MATLAB	
<b>Expt. 13</b>	<b>STABILITY ANALYSIS (BODE, ROOT LOCUS, NYQUIST) OF LINEAR TIME INVARIANT SYSTEM.</b>
To perform Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB	
<b>Expt. 14</b>	<b>VERIFICATION OF STATE SPACE MODEL FOR CLASSICAL TRANSFER FUNCTIONS.</b>
To study State space model for classical transfer function using MATLAB – Verification	
<b>Expt. 15</b>	<b>VERIFICATION OF EFFECT OF ADDING POLES AND ZEROES TO A SYSTEM.</b>
To study Effect of adding poles and zeroes to a system- MATLAB Verification	
<b>Expt. 16</b>	<b>VERIFICATION OF LEAD-LAG COMPENSATION.</b>
To Design a lead/lag or lead-lag compensator - MATLAB Verification	
<b>Reference Books</b>	
1. M.H.Rashid “Simulation of Electrical and electronics Circuits using PSPICE”, M/s PHI Publications.	
2. J Nagrath, M Gopal, “Control Systems Engineering”, New Age International, 3rd Edition, 2007	
3. K Ogata, “Modern Control Engineering”, Prentice Hall, 4th Edition, 2003.	
4. Benjamin Kuo, “Automatic Control Systems”, PHI, 7th Edition, 1987.	
<b>Web References</b>	
1. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a>	
2. <a href="https://www.researchgate.net">https://www.researchgate.net</a>	
3. <a href="https://www.deltaww.com">https://www.deltaww.com</a>	
<b>Course Home Page</b>	
<b>SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:</b>	
<b>SOFTWARE:</b> MATLAB	
<b>HARDWARE:</b> Desktop Computers (03 nos)	
<b>Outcomes:</b>	
At the end of the course students able to	
1. Obtain transfer functions of LTI systems and servomotors	
2. Write MATLAB programming for the analysis of LTI system	
3. Find the stability of the system through MATLAB programming	
4. Design controllers, compensators using MATLAB software	

### PROFESSIONAL ACTIVITIES-III

<b>B. Tech V Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EC303</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	-	-
<b>Contact Classes:24</b>		<b>Tutorial Classes: -</b>		<b>Practical CLASSES:-</b>		<b>Total Classes: 24</b>		

#### **OBJECTIVES:**

**The course should enable the students to :**

1. Improve communication skills
2. Develop leadership qualities

Professional Society Activities (PSA) course is aimed at enhancing the self-learning, communication, managerial skills of the students by engaging them in various Co & Extra Curricular activities during their course of Study. Activities in each of the department shall be designed and conducted by the Professional Society Executive Committee whose composition is:

1. Faculty Mentors- 2 No.
2. Student Chairman: 1 No.- Final year Student
3. Student General Secretary: 1 No.- Third year Student
4. Treasurer: 1 No.- Third year Student

Student Members: 2 No's from each class

PSA related activities would be of the following nature but not limited to:

<b>Activity#1</b>	Just A Minute
<b>Activity#2</b>	Technical Quiz
<b>Activity#3</b>	Open House- Lab Demo
<b>Activity#4</b>	Technical Paper Presentation- Preliminary
<b>Activity#5</b>	Technical Paper Presentation- Final
<b>Activity#6</b>	Poster Presentation
<b>Activity#7</b>	Collage- A theme based event
<b>Activity#8</b>	Debate Competition
<b>Activity#9</b>	Group Discussion Competition
<b>Activity#10</b>	Mock Interviews
<b>Activity#11</b>	Model Exhibition
<b>Activity#12</b>	Valedictory Function

#### **Outcomes:**

1. Attain Oral Presentation skills by answering questions in precise and concise manner
2. Evaluate themselves about their knowledge in their domain
3. Gain confidence and inter-personal skills
4. Transforming Engineering Culture to Advance Inclusion and Diversity
5. Apply their knowledge to design engineering models
6. Exhibit the professional behavior

## QUANTITATIVE APTITUDE

<b>B. Tech V Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18AS502	Core	L	T	P	C	CIA	SEE	TOTAL
		2	0	0	0	-	-	-
<b>Contact Classes:36</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes: -</b>		<b>Total Classes: 36</b>		
<b>OBJECTIVES:</b>								
<p><b>The course should enable the students to :</b></p> <ol style="list-style-type: none"> <li>1. Formulate the problem quantitatively and use appropriate arithmetical methods to solve the problem.</li> <li>2. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.</li> <li>3. Solve campus placements aptitude papers covering Quantitative Ability</li> <li>4. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.</li> </ol>								
<b>UNIT-I</b>								
Calendars, Clocks, L. C. M & H. C. F, Problems on Numbers, Averages.							<b>CLASSES:7</b>	
<b>UNIT-II</b>								
Percentages, Profit, Loss & Discount, Simple Interest & Compound Interest.							<b>CLASSES:8</b>	
<b>UNIT-III</b>								
Ratio & Proportion, Mixture and Alligation, Partnership, problems on ages.							<b>CLASSES:7</b>	
<b>UNIT-IV</b>								
Time & Work, Pipes and Cisterns							<b>CLASSES:7</b>	
<b>UNIT-V</b>								
Time & Distance, Problem on Trains, Boats and Streams, Mensuration.							<b>CLASSES:8</b>	
<b>Text Books:</b>								
1. Dr. R.S. Aggarwal, "Quantitative Aptitude", S.Chand Publication, New Delhi.								
<b>Reference Books:</b>								
1. Quantitative Aptitude - G. L BARRONS								
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", 4th Edition.								
<b>Web References:</b>								
1. <a href="http://www.indiabix.com">www.indiabix.com</a>								
2. <a href="https://www.campusgate.co.in">https://www.campusgate.co.in</a>								
3. <a href="https://m4maths.com">https://m4maths.com</a>								
<b>Outcomes:</b>								
<ol style="list-style-type: none"> <li>1. Formulate the problem quantitatively and use appropriate arithmetical, and/or statistical methods to solve the problem</li> <li>2. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions</li> <li>3. Interpret quantitative information (i.e., formulas, graphs, tables, models, and schematics) and draw implications from them</li> <li>4. Critically evaluate various real life situations by resorting to analysis of key issues and factors</li> <li>5. Develop analytical and organizational skills</li> </ol>								

## INDIAN CONSTITUTION

<b>B. Tech V Semester – Electrical and Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
18MD501	MC	2	-	-	0	0	0	0
<b>Contact Classes: 24</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: -</b>			<b>Total Classes: 24</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
1. Understand the premises informing the twin themes of liberty and freedom from a civil right perspective.								
2. Address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.								
3. Address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.								
<b>UNIT-I</b>	<b>HISTORY OF MAKING OF THE INDIAN CONSTITUTION &amp; PHILOSOPHY OF THE INDIAN CONSTITUTION</b>						<b>CLASSES: 08</b>	
History of Making of the Indian Constitution: History, Drafting Committee, ( Composition & Working) Philosophy of the Indian Constitution: Preamble, Salient Features								
<b>UNIT-II</b>	<b>CONTOURS OF CONSTITUTIONAL RIGHTS &amp; DUTIES</b>						<b>CLASSES: 04</b>	
Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.								
<b>UNIT-III</b>	<b>ORGANS OF GOVERNANCE</b>						<b>CLASSES: 04</b>	
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive President, Governor, Council of Minister. Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions								
<b>UNIT-IV</b>	<b>LOCAL ADMINISTRATION</b>						<b>CLASSES: 04</b>	
District’s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grassroot democracy								
<b>UNIT-V</b>	<b>ELECTION COMMISSION</b>						<b>CLASSES: 04</b>	
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.								
<b>Text Books:</b>								
1. Dr. S. N. Busi, “Dr. B. R. Ambedkar framing of Indian Constitution”, 1 <sup>st</sup> Edition, 2015.								
2. M. P. Jain, “Indian Constitution Law”, Lexis Nexis, 7 <sup>th</sup> Edition, 2014.								

## SIGNALS AND SYSTEMS

<b>B. Tech VI Semester: Electronics and communication Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EC303</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:60</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes: -</b>		<b>Total Classes: 60</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
1. Differentiate between continuous and discrete time signals.								
2. Know Fourier representation of signal.								
3. Emphasize on Fourier spectrum of signal.								
4. Know the Ideal characteristics of filters.								
<b>UNIT-I</b>	<b>SIGNALS &amp; SYSTEMS</b>						<b>CLASSES:15</b>	
Definition and classification of Signal and Systems (Continuous time and Discrete time), Elementary signals such as Dirac delta, unit step, ramp, sinusoidal and exponential and operations on signals. Analogy between vectors and signals-orthogonality-Mean Square error-Fourier series: Trigonometric & Exponential and concept of discrete spectrum								
<b>UNIT-II</b>	<b>CONTINUOUS TIME FOURIER TRANSFORM</b>						<b>CLASSES:15</b>	
Definition, Computation and properties of Fourier Transform for different types of signals. Statement and proof of sampling theorem of low pass signals, Nyquist rate. <b>SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS:</b> Linear system, impulse response, Response of a linear system, linear time invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics								
<b>UNIT-III</b>	<b>Convolution &amp; Correlation</b>						<b>CLASSES:10</b>	
Convolution and Correlation, autocorrelation and cross correlation, energy density spectrum, Parseval's theorem, power density spectrum, relation between autocorrelation and spectral density function, relation between convolution and correlation. <b>LAPLACE TRANSFORM:</b> Definition-ROC-Properties-Inverse Laplace transforms-the S-plane and BIBO stability-Transfer Functions-System Response to standard signals-Solution of Differential equations with initial conditions.								
<b>UNIT-IV</b>	<b>DISCRETE TIME FOURIER TRANSFORM</b>						<b>CLASSES:10</b>	
Definition, Computation and properties Of Fourier Transform for different types of signals.								
<b>UNIT-V</b>	<b>The Z-TRANSFORM</b>						<b>CLASSES:10</b>	
Derivation and definition-ROC-Properties-Linearity, time shifting, change of scale, Z-domain differentiation, differencing, accumulation, convolution in discrete time, initial and final value theorems-Poles and Zeros in Z-plane. The inverse Z-Transform-System analysis-Transfer function-BIBO stability-System Response to standard signals- Solution of difference equations with initial conditions								
<b>Text Books:</b>								
1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab , Signals and Systems, PHI, 2nd Edition, 2009								
2. Simon Haykin and Van Veen ,Signals& Systems, Wiley, 2nd Edition, 2007.								
3. B.P. Lathi, Signals, Systems & Communications, BS Publications, 1 edition 2008.								
<b>Reference Books:</b>								

1. Michel J. Robert , Fundamentals of Signals and Systems, MGH International Edition,2008.
2. M.J.Roberts , Signals and Systems Analysis using Transform method and MATLAB , TMH, 1st edition, 2007.

**Web References:**

1. [http://www.site.uottawa.ca/~jpyao/courses/ELG3120\\_files/ch1.pdf](http://www.site.uottawa.ca/~jpyao/courses/ELG3120_files/ch1.pdf)
2. <http://mathworld.wolfram.com/FourierSeries.html>
3. [https://en.wikipedia.org/wiki/Laplace\\_transform](https://en.wikipedia.org/wiki/Laplace_transform)

**E-Text Books:**

1. <http://www.eng.ucey.ac.cy/cpitris/courses/ece623/notes/ SignalsAndSystems.pdf>
2. <http://www.alphace.ac.in/downloads/notes/ece/10ec44.pdf>

**Outcomes:**

1. Classify the mathematical description and representation of continuous and discrete time signals and systems.
2. Understand and resolve the signals in frequency domain using Fourier series.
3. Understand and resolve the signals in frequency domain using Fourier transforms,LTI Systems.
4. Understand different types of Sampling and Convolution & correlation methods,Sampling.
5. Analyze the system in s- domain.
6. Analyze the system in z- domain.

## MICROPROCESSORS AND MICROCONTROLLERS

<b>B. Tech VI Semester: Electronics and communication Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EC505	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: -</b>			<b>Total Classes: 60</b>			

<b>OBJECTIVES:</b>		
<p><b>The course should enable the students to:</b></p> <ol style="list-style-type: none"> <li>Understand fundamental operating concepts behind microprocessors and microcontrollers.</li> <li>Appreciate the advantages in using RISC microprocessors / microcontrollers in engineering applications</li> <li>Design microprocessor / microcontroller based solutions to problems.</li> <li>Develop skill in simple program writing for 8086; MSP430 and application.</li> </ol>		
<b>UNIT-I</b>	<b>INTRODUCTION</b>	<b>CLASSES:20</b>
Introduction-8085 Architecture-Block Diagram, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagram, Overview of 8086-Internal Architecture- Register Organization, Memory Segmentation, Flag Register, Pin Configuration. Interrupt structure of 8085 and 8086		
<b>UNIT-II</b>	<b>INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING OF 8086</b>	<b>CLASSES:10</b>
Instruction Formats -Addressing Modes-Instruction Set of 8086, Assembler Directives-Macros and Procedures. Programs Involving Logical, Branch Instructions – Sorting and Evaluating Arithmetic Expressions – String Manipulations-Simple ALPs. Brief discussion of peripheral sub systems like 8251, 8253, 8255, 8257 and 8259 (only Pin diagrams and key features of these peripheral sub systems)		
<b>UNIT-III</b>	<b>INTERFACING WITH ADVANCED DEVICES</b>	<b>CLASSES:10</b>
Comparison between RISC and CISC architecture, Low power RISC MSP430 – block diagram, features and architecture, Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Sample embedded system on MSP430 microcontroller.		
<b>UNIT-IV</b>	<b>INTRODUCTION TO MSP 340</b>	<b>CLASSES:10</b>
I/O ports pull up/down registers concepts, Interrupts and interrupt programming. Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability. Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA. Case Study: MSP430 based embedded system application using ADC & PWM demonstrating peripheral intelligence. “Remote Controller of Air Conditioner Using MSP430”		
<b>UNIT-V</b>	<b>COMMUNICATION INTERFACE</b>	<b>CLASSES:10</b>
Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices. Implementing Embedded Wi-Fi using C3100 Case Study: MSP430 based embedded system application using the interface protocols for communication with external devices: “A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID”		

**Text Books:**

1. “Microprocessor and Microcontrollers”, N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Oxford Publishers. 1 st Edition, 2010
2. “The X86 Microprocessors , Architecture, Programming and Inerfacing” , Lyla B. Das, Pearson Publications, 2010

**Reference Books:**

1. MSP430 microcontroller basics. John H. Davies, Newnes Publication, I st Edition

**Web References:**

1. [http://processors.wiki.ti.com/index.php/MSP430\\_LaunchPad\\_Low\\_Power\\_Mode\\_2](http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode_2).

**E-Text Books:**

1. [http://processors.wiki.ti.com/index.php/MSP430\\_16-Bit\\_Ultra Low\\_Power\\_MCU\\_Training](http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra_Low_Power_MCU_Training).

**Outcomes:**

1. Understands the internal architecture and organization of 8085 & 8086 processors, MSP430 controller.
2. Design and implement programs on 8086 microprocessor
3. Understands the interfacing techniques to 8086 and MSP 430 and can develop assembly language programming to design microprocessor/ micro controller based systems.
4. Program MSP 430 for designing any basic Embedded System.
5. Classify different communication protocols synchronous or asynchronous.
6. Design and implement some specific real time applications.

## POWER SYSTEM ANALYSIS

<b>B. Tech VI Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE601	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: -</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
The course should enable the students to:								
<ol style="list-style-type: none"> <li>Determine the bus impedance and admittance matrices for power system network.</li> <li>Calculate various parameters at different buses using load flow studies and numerical methods.</li> <li>Discuss the symmetrical component theory, sequence networks, short circuit calculations and per-unit representation power system.</li> <li>Understand the steady state stability of power system and suggest improvements.</li> <li>Analyze the transient stability of power system and check methods to improve the stability.</li> </ol>								
<b>UNIT-I</b>	<b>POWER SYSTEM NETWORK MATRICES</b>						<b>CLASSES:12</b>	
Graph Theory: Definitions, bus incidence matrix, Y bus formation by direct and singular transformation methods, numerical problems; Formation of Z Bus: Partial network, algorithm for the modification of Z bus matrix for addition of an element from a new bus to reference bus, addition of element from a new bus to an old bus, addition of element between an old bus to reference bus and addition of element between two old busses (Derivations and Numerical Problems), modification of Z bus for the changes in network, numerical problems.								
<b>UNIT-II</b>	<b>LOAD FLOWS STUDIES</b>						<b>CLASSES:12</b>	
Load flows studies: Necessity of power flow studies, data for power flow studies, derivation of static load flow equations; Load flow solutions using Gauss Seidel method: Acceleration factor, load flow solution with and without PV buses, algorithm and flowchart; Numerical load flow solution for simple power systems (Max. 3 buses): Determination of bus voltages, injected active and reactive powers (Sample one iteration only) and finding line flows / losses for the given bus voltages; Newton Raphson method in rectangular and polar coordinates form: Load flow solution with or without PV busses derivation of Jacobian elements, algorithm and flowchart, decoupled and fast decoupled methods, comparison of different methods.								
<b>UNIT-III</b>	<b>PER UNIT SYSTEM OF REPRESENTATION, SHORT CIRCUIT ANALYSIS</b>						<b>CLASSES:12</b>	
Per unit system: Equivalent reactance network of a three phase power system, numerical problems; Symmetrical Fault Analysis: Introduction, transient on a transmission line, short circuit of a synchronous machine (on no load), short circuit of a synchronous machine (on load), Symmetrical Component: Introduction, symmetrical component transformation, phase shift in star delta transformer, sequence impedance of transmission line, sequence impedance and sequence network of power system, sequence impedance and sequence network of synchronous machine, sequence impedance of transmission line and network of transformer, construction of sequence network of a power system. Unsymmetrical Fault Analysis: Introduction, symmetrical component analysis of unsymmetrical faults, single line to ground (LG) fault, line to line (LL) fault, double line to ground (LLG) fault, open conductor fault bus impedance matrix method for analysis of unsymmetrical shunt fault.								
<b>UNIT-IV</b>	<b>STEADY STATE STABILITY ANALYSIS</b>						<b>CLASSES:12</b>	

Steady state stability: Elementary concepts of steady state, dynamic and transient stabilities, description of steady state stability power limit, transfer reactance, synchronizing power coefficient, power angle curve and determination of steady state stability and methods to improve steady state stability.

**UNIT-V**

**TRANSIENT STATE STABILITY ANALYSIS**

**CLASSES:12**

Swing equation: Derivation of swing equation, determination of transient stability by equal area criterion, application of equal area criterion, critical clearing angle calculation, solution of swing equation, point by point method, methods to improve stability, application of auto reclosing and fast operating circuit breakers.

**Text Books:**

1. I J Nagrath & D P Kothari, "Modern Power system Analysis", Tata McGraw-Hill Publishing Company, 2nd Edition, 2001.
2. C L Wadhwa, "Electrical Power Systems", New age International, 3rd Edition, 2002.
3. M A Pai, "Computer Techniques in Power System Analysis", TMH Publications, 2nd Edition, 2004.

**Reference Books:**

1. K Umarao, "Computer techniques and models in power systems", I K International Pvt. Ltd, 1st Edition, 2000.
2. Hadi Saadat, "Power System Analysis", TMH, 2nd Edition, 2003.
3. Grainger and Stevenson, "Power System Analysis", Tata McGraw-Hill, 3rd Edition, 2011.
4. J Duncan Glover and M S Sarma., THOMPSON, "Power System Analysis and Design", 3rd Edition 2006.
5. Abhijit Chakrabarthy and Sunita Haldar, "Power system Analysis Operation and control", PHI 3rd Edition, 2010.

**Web References:**

1. <https://www.worldcat.org/title/computer-methods-in-power-system-analysis/.../600788826>
2. <https://www.sjbit.edu.in/.../COMPUTER%20%20TECHNIQUES%20IN%20POWER%20%20SYS>.
3. <https://www.books.google.com> › Technology & Engineering › Electrical
4. <https://www.nptel.ac.in/courses/108105067/>
5. <https://www.jntusyllabus.blogspot.com/2012/01/computer-methods-power-systems-syllabus.htm>

**E-Text Books:**

1. <https://www.scribd.com/.../Computer-Methods-in-Power-System-Analysis-by-G-W-St...>
2. [https://www.academia.edu/8352160/Computer\\_Methods\\_and\\_Power\\_System\\_Analysis\\_Stagg](https://www.academia.edu/8352160/Computer_Methods_and_Power_System_Analysis_Stagg)
3. <https://www.uploady.com/#!/download/ddC9obmVTiv/NwO1AnQrlmogeJjS>
4. [https://www.materialdownload.in/article/Computer-Methods-in-Power-System-Analysis\\_159/](https://www.materialdownload.in/article/Computer-Methods-in-Power-System-Analysis_159/) 5.
5. <https://www.ee.iitm.ac.in/2015/07/ee5253/>

**Outcomes:**

At the end of the course students able to

1. Demonstrate an understanding of the nature of the modern power system, including the behavior of the constituent components and sub-systems
2. Apply load flow analysis to an electrical power network and interpret the results of the analysis
3. Analyze a network under both balanced and unbalanced fault conditions and interpret the results methods for power system analysis in steady state operation
4. Demonstrate an understanding of the factors which determine transient stability in both single machine and multi-machine systems
5. Analyze the transient stability of a single machine/infinite bus system using both analytical and time simulation methods

## POWER SEMICONDUCTOR DRIVES

<b>B. Tech VI Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE602	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes:-</b>	<b>Practical CLASSES:-</b>			<b>Total Classes: 60</b>			

### OBJECTIVES

The course should enable the students to:

1. To learn the basics of power semiconductor switches
2. To understand the working of various types of converters and application of them.
3. To understand and design the drive circuits for various Power Semi- conductor Switches.
4. To learn to model the converters and semiconductor switches.
5. To learn about the control of various power semi conductor switches.

<b>UNIT-I</b>	<b>INTRODUCTION TO ELECTRIC DRIVES, CONVERTER FED DC DRIVES</b>	<b>CLASSES:10</b>
Electric drive- definition- advantages of electric drives-dynamics control of electric drives-closed loop control. Single and three Phase (semi and fully controlled) converter fed DC separately excited and series motors- continuous current operation, output voltage and current waveforms, Speed – Torque expressions & characteristics. Electric Braking: Plugging, Dynamic and Regenerative Braking operations.		
<b>UNIT-II</b>	<b>FOUR QUADRANT OPERATION OF DC DRIVES, CONTROL OF DC MOTORS BY CHOPPERS</b>	<b>CLASSES:15</b>
Introduction to Four quadrant operation, Motoring and Braking operations, Four quadrant operation of DC motors by dual converters, closed loop operation of DC motor. Single quadrant, Two –quadrant and four quadrant chopper fed DC separately excited and series motors: Continuous current operation, Output voltage and current waveforms, Speed torque expressions, speed torque characteristics, Problems on Chopper fed DC Motors, Closed Loop operation of chopper fed drives.		
<b>UNIT-III</b>	<b>VOLTAGE CONTROL OF INDUCTION MOTORS, FREQUENCY CONTROL OF INDUCTION MOTORS</b>	<b>CLASSES:15</b>
Variable voltage characteristics of induction motors, Control of Induction Motor by AC Voltage Controllers, speed torque characteristics. Variable frequency characteristics, Variable frequency control of induction motor by Voltage source and current source inverter and cyclo-converters, PWM control, Comparison of VSI and CSI operations, Speed torque characteristics .Closed loop operation of induction motor drive.		
<b>UNIT-IV</b>	<b>ROTOR SIDE CONTROL OF INDUCTION MOTOR</b>	<b>CLASSES:10</b>
Static rotor resistance control, Slip power recovery, Static Scherbius drive, Static Kramer Drive , their performance and speed torque characteristics, advantages , applications , problems.		
<b>UNIT-V</b>	<b>CONTROL OF SYNCHRONOUS MOTORS</b>	<b>CLASSES:10</b>

**Control of Synchronous Motors:** Separate control & self control of synchronous motors, Operation of self controlled synchronous motors by VSI, CSI and cyclo-converters. Load commutated CSI fed Synchronous Motor, Operation, Waveforms, speed torque characteristics, Applications, Advantages and Problems, Closed Loop control of synchronous motor drives.

**Text Books:**

1. GKDubey“Fundamentals of Electric Drives”,Narosa Publications. 2002
2. MD Singh and K B Kanchandhani “Power Electronics”, Tata McGraw-Hill Publishing Company, 1998.

**Reference Books:**

1. M.H.Rashid “Power Electronic Circuits, Devices and applications”, PHI.
2. B.K.Bose “Modern Power Electronics and AC Drives”, PHI.

**Web References**

1. <https://www.researchgate.net>
2. <https://www.aar.faculty.asu.edu/CLASSES>
3. <https://www.facstaff.bucknell.edu/>
4. <https://www.electrical4u.com>

**E-Text Books**

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

**Outcomes**

1. Control DC and AC drives.
2. Analyze the operation of the converter, chopper fed dc drive.
3. Analyze the operation of both Induction & Synchronous machine drives.
4. Design the current and speed controllers for a closed loop solid-state dc motor drive
5. Select the drives for any particular application.
6. Understand the working of various phase controlled converters used in AC Drives.

## HIGH VOLTAGE ENGINEERING (ELECTIVE-I)

<b>B. Tech VI Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE603</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes: 60</b>		<b>Tutorial Classes: 0</b>		<b>Practical Classes: 0</b>			<b>Total Classes: 60</b>	

### OBJECTIVES

The course should enable the students to:

1. Understand the operation of high voltage power supplies for ac, dc, and impulse voltages.
2. Understand the principles of theory of high voltage generation and measurements.
3. Understand the Breakdown mechanism of Gas, Liquid and solid insulation.
4. Understand the testing methods of high voltage equipment .

<b>UNIT-I</b>	<b>OVER VOLTAGES IN POWER SYSTEMS AND BREAKDOWN MECHANISM</b>	<b>CLASSES:10</b>
Introduction, Causes of over voltages and its effects on power system – Lightning, switchingsurgesandtemporaryovervoltages–ReflectionandRefraction of Travelling waves- Protection against over voltages. Breakdown mechanism basics of Gases, Liquid and Solid materials.		
<b>UNIT-II</b>	<b>GENERATION OF HIGH DC AND AC VOLTAGES</b>	<b>CLASSES:10</b>
Rectifier circuits, Cockcroft- Walton voltage multiplier circuit, electrostatic generator, generation of high ac voltages by cascaded transformers, series resonant circuit.		
<b>UNIT-III</b>	<b>GENERATION OF IMPULSE VOLTAGES AND CURRENTS</b>	<b>CLASSES:15</b>
Definitions, impulse generator circuits, Analysis of impulse generator circuit, multistage impulse generator circuit, triggering of impulse generator, impulse current generation.		
<b>UNIT-IV</b>	<b>MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS</b>	<b>CLASSES:10</b>
Introduction, uniform field spark gap, rod gap, electrostatic voltmeter, generating voltmeter, Fortes cue method, resistive and capacitive voltage dividers, measurement of high DC, AC and impulse currents.		
<b>UNIT-V</b>	<b>HIGH VOLTAGE TESTING &amp; INSULATION COORDINATION</b>	<b>CLASSES:15</b>
Testing of overhead line insulators, testing of cables, Testing of Bushings, Testing of power capacitors, testing of power transformers, testing of circuit breakers. Measurement of resistance, High voltage Schering Bridge. Insulation coordination-voltage time curve.		

### Text Books:

1. C.L. Wadhwa: High voltage Engineering, New Age International Publishers,2012.
2. E. Kuffel, W.S. Zaengl, J. Kuffel, High voltage Engineering Fundamentals, Newnes Publishers, 2011
3. M.S. Naidu & Kamaraju, High- voltage Engineering, McGraw Hill Education (India) Private limited, 2013.

### Reference Books:

1. Ravindra Arora & Wolfgang Mosch: High voltage Insulation Engineering, New Age International Publishers, 2016.
2. High Voltage Engineering, Theory and Practice, Mazen Abdel Salam, Hussein Anis, Ahdan El-Morshedy, Roshdy Radwan, Marcel Dekker
- 3.Modern Power System Analysis – by I.J.Nagarath &D.P.Kothari: Tata McGraw Hill Publishing Company, 2ndEdition.

**Web References:**

1. <https://nptel.ac.in/courses/108/104/108104013/>
2. <https://nptel.ac.in/courses/108/104/108104048/>
3. <https://www.springer.com/us/book/9783642119927>

**E-Text Books:**

1. <https://www.facstaff.bucknell.edu/>
2. <https://www.freeengineeringbooks.com>
3. <https://www.aar.faculty.asu.edu/CLASSES>

**Outcomes:**

At the end of the course students able to

1. Develop the knowledge of HVDC transmission and HVDC converters and the applicability and advantage of HVDC transmission over conventional AC transmission.
2. Formulate and solve mathematical problems related to rectifier and inverter control methods and learn about different control schemes as well as starting and stopping of DC links
3. Analyze the different harmonics generated by the converters and their variation with the change in firing angles.
4. Develop harmonic models and use the knowledge of circuit theory to develop filters and assess the requirement and type of protection for the filters.
5. Study and understand the nature of faults happening on both the AC and DC sides of the converters and formulate protection schemes for the same.
6. Review the existing HVDC systems along with MTDC systems and their controls and recognize the need to follow the advancements in both the existing systems and HVDC systems and determine the most economic coexistence of both

## ELECTRICAL ENERGY CONSERVATION AND AUDITING (ELECTIVE-I)

<b>B. Tech VI Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE604</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:60</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>		<b>Total Classes: 60</b>		

### OBJECTIVES

The course should enable the students to

1. To provide students with a general awareness on the importance of energy and its conservation, its impact on society.
2. To know various energy sources, energy conversion processes, energy management, energy audit and energy conservation measures.

<b>UNIT-I</b>	<b>ENERGY RESOURCES AND CONVERSION</b>	<b>CLASSES:15</b>
Energy resources, Energy conversion processes and devices – Energy conversion plants –Conventional – Thermal, Hydro, Nuclear fission , and Non – conventional – Solar, Wind Biomass, Fuel cells, Magneto Hydrodynamics and Nuclear fusion. Energy from waste, Energy plantation.		
<b>UNIT-II</b>	<b>ENERGY STORAGE AND DISTRIBUTION</b>	<b>CLASSES:15</b>
Energy storage and Distribution – Electrical energy route – Load curves – Energy conversion plants for Base load , Intermediate load, Peak load and Energy displacement – Energy storage plants.		
<b>UNIT-III</b>	<b>ENERGY CONSERVATION</b>	<b>CLASSES:10</b>
Energy conservation – Principles – Energy economics – Energy conservation technologies – cogeneration – Waste heat recovery – Combined cycle power generation – Heat Recuperators – Heat regenerators – Heat pipes – Heat pumps – Pinch Technology Energy Conservation Opportunities – Electrical ECOs – Thermodynamic ECOs in chemical process industry – ECOs in residential and commercial buildings – Energy Conservation Measures.		
<b>UNIT-IV</b>	<b>ENERGY MANAGEMENT</b>	<b>CLASSES:10</b>
Energy Management – Definitions and significance – objectives –Characterizing of energy usage – Energy Management program – Energy strategies and energy planning Energy Audit – Types and Procedure – Optimum performance of existing facilities – Energy management control systems – Computer applications in Energy management.		
<b>UNIT-V</b>	<b>ENERGY AUDIT</b>	<b>CLASSES:10</b>
<b>Energy Audit:</b> Aim of energy Audit, Strategic of Energy Audit, Energy management Team Consideration in implementing energy conservation Programme, Instruments for energy audit, Energy audit of Electrical Systems, HVAC, Buildings, Economic analysis.		
<b>Text Books:</b>		

1. Tripathy S.C., "Electric Energy Utilization and Conservation", Tata McGraw Hill.
2. Industrial Energy Conservation Manuals, MIT Press, Mass
3. "The Efficient Use of Energy", Edited by I.G.C.Dryden, Butterworths, London
4. Energy Management Handbook, Edited by W.C.Turner, Wiley, New York

#### Reference Books:

1. Amlan Chakrabarti, Energy Engineering and Management, Prentice Hall India, 2011.
2. Eastop T. D. and D. R. Croft, Energy Efficiency for Engineers & Technologists, Longman, 1990.
3. Albert Thumann P. E. and W. J. Younger, Handbook of Energy Audits, Fairmont Press, 2008.
4. Doty S. and W. C. Turner, Energy Management Hand book, 7/e, Fairmont Press, 2009.
5. Rao S. and B. B. Parulekar, Energy Technology, Khanna Publishers, 2005.
6. Rai G. D., Non-conventional Energy Sources, Khanna Publishers, 2011.

#### Web References:

1. <https://www.slideshare.net/RichaChaudhary2/energy-conservation-ppt>
2. <https://nptel.ac.in/courses/112/105/112105221/>

#### E-Text Books:

1. <https://www.freeengineeringbooks.com>
2. <http://lab.fs.uni-lj.si/kes/erasmus/Energy%20Management%20Handbook.pdf>
3. Pdfdrive.net

#### Outcomes:

At the end of the course students able to

1. Apply the knowledge of the subject to calculate the efficiency of various thermal utilities.
2. Design suitable energy monitoring system to analyze and optimize the energy consumption in an organization.
3. Improve the thermal efficiency by designing suitable systems for heat recovery and co-generation.
4. Use the energy audit methods learnt to identify the areas deserving tighter control to save energy expenditure.
5. Carry out the cost- benefit analysis of various investment alternatives for meeting the energy needs of the organization.
6. Guide the employees of the organization about the need and the methods of energy conservation.

## COMPUTER ARCHITECTURE (ELECTIVE-I)

<b>B. Tech VI Semester: Computer Science and Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18CS609</b>	<b>Core</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:60</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes: -</b>		<b>Total Classes: 60</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
1 Acquire the knowledge about simplifying the circuits by different methods.								
2 Understand the basic organization of Computer system and its Instructions.								
3 Learn the instructions to write assembly language program.								
4. Analyze the Pipeline processing and DMA Techniques.								
<b>UNIT-I</b>	<b>INTRODUCTION &amp; RTL</b>						<b>CLASSES:11</b>	
INTRODUCTION & RTL: Organization and architecture, Block diagram of digital computer, Structure and function. Register Transfer language — Register Transfer Bus and memory transfers.								
<b>UNIT-II</b>	<b>COMPUTER ARITHMETIC</b>						<b>CLASSES:13</b>	
COMPUTER ARITHMETIC: Arithmetic micro operations, Logic micro Operations, Shift micro operations and Arithmetic logic shift unit. Addition and subtraction, Multiplication Algorithms and Division Algorithms, Floating point representation and its operations								
<b>UNIT-III</b>	<b>BASIC COMPUTER ORGANIZATION AND DESIGN</b>						<b>CLASSES:14</b>	
BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes, Computer Registers, Computer instructions, Instruction cycle, Memory—Reference Instructions, Register Reference instructions, Input-Output and Interrupt, Stack organization, Instruction formats, Addressing modes, Data Transfer and manipulation, Program control, Reduced Instruction set computer.								
<b>UNIT-IV</b>	<b>PIPELINE PROCESSING &amp; MEMORY ORGANIZATION</b>						<b>CLASSES:10</b>	
<b>PIPELINE PROCESSING &amp; MEMORY ORGANIZATION:</b> Pipeline processing-Parallel processing, Pipelining, Arithmetic pipeline, Instruction pipeline, RISC pipeline. The memory organization - Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory.								
<b>UNIT-V</b>	<b>INPUT- OUTPUT ORGANIZATION</b>						<b>CLASSES:12</b>	
INPUT- OUTPUT ORGANIZATION: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access, Input-Output Processor (IOP), Serial communication.								
<b>TEXT BOOKS:</b>								
1.M.MorisMano,“ComputerSystemsArchitecture”,3 <sup>d</sup> edition,Pearson/PrenticeHallIndia, 2007								
2. WilliamStallings,“ComputerOrganizationandArchitecture”,7 <sup>th</sup> edition,Pearson/Prentice Hall India ,2007.								
<b>REFERENCE BOOKS:</b>								
1. CarlHamacher,ZvonkoVranesicandSafwatZaky,“ComputerOrganization”,5 <sup>th</sup> edition, Tata McGraw Hill,2007.								
2. VincentP.HeuringandHarryFJordan,"ComputerSystemsDesignandArchitecture",2 edition, Pearson/Prentice Hall India,2004.								
3. David A Patterso and John L Hennessy, “Computer Organization and Design - The Hardware/								

Software Interface, ARM edition", 5<sup>th</sup> edition, Elsevier, 2009.

**Web Reference:**

1. [https://www.tutorialspoint.com/computer\\_logical\\_organization/](https://www.tutorialspoint.com/computer_logical_organization/)
2. <https://www.coursera.org/learn/comparch>
3. <https://www.cssimplified.com/.../computer-organization-and-assembly-language-programming>

**E Textbook:**

1. <https://www.groupees.polymtl.ca/inf2610/.../ComputerSystemBook.pdf>
2. <https://www.cse.hcmut.edu.vn/~vtphuong/KTMT/Slides/TextBookFull.pdf>

**Course Outcome:**

At the end of the course students able to

1. Analyze the pipe line processing and DMA Techniques.
2. Learn the instructions to write assembly language program
3. Understand the basic organization of computer system and its instructions

**AVAILABLE MOOCs  
(ELECTIVE-I)**

<b>B. Tech VI Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE606	Elective	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: -</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>		<b>Total Classes: -</b>		
<p>Meeting with the global requirements, to inculcate the habit of self learning and in compliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers</p> <p><b>Regulations for MOOCs</b></p> <ul style="list-style-type: none"> <li>➤ The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.</li> <li>➤ Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.</li> <li>➤ A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.</li> <li>➤ The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.</li> <li>➤ Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.</li> <li>➤ There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.</li> <li>➤ Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.</li> </ul>								

## NEURAL NETWORKS AND FUZZY LOGIC (OPEN ELECTIVE-II)

<b>B. Tech VI Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE607</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes: 60</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes: -</b>		<b>Total Classes: 60</b>		

### OBJECTIVES

1. This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.
2. To deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components along with Genetic Algorithms.
3. The Application of Soft Computing Techniques to Electrical Engineering is also presented.

<b>UNIT-I</b>	<b>ARTIFICIAL NEURAL NETWORKS AND ITS ESSENTIALS</b>	<b>CLASSES:15</b>
<p><b>Artificial Neural Networks and Its Essentials:</b> Introduction, Biological Neuron, Artificial Neuron, Basic concepts of Neural Networks, Basic Models of ANN Connections, McCulloch-Pitts Model, Characteristics of ANN, Applications of ANN. Artificial Neuron Model. Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.</p>		
<b>UNIT-II</b>	<b>LEARNING AND ASSOCIATIVE MEMORY NETWORKS</b>	<b>CLASSES:10</b>
<p>Perceptron Network, Perceptron Learning Rule, Architecture, Perceptron Training Algorithm, ADALINE, MADALINE, Back Propagation Network, BP Learning Rule, Input Layer Computation, Hidden Layer Computation, Output Layer Computation, Radial Basis Function, Associative Memory, Bidirectional associative memory.</p>		
<b>UNIT-III</b>	<b>FUZZY LOGIC</b>	<b>CLASSES:15</b>
<p>Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.</p>		
<b>UNIT-IV</b>	<b>GENETIC ALGORITHMS</b>	<b>CLASSES:10</b>
<p>Introduction, Basic Operators and Terminologies in GA, Traditional Vs Genetic Algorithm, Encoding, Fitness Function, Reproduction, Crossover, Mutation Operator.</p>		
<b>UNIT-V</b>	<b>AI APPLICATIONS TO ELECTRICAL SYSTEMS</b>	<b>CLASSES:10</b>

ANN based Short term Load Forecasting, Load flow Studies, Fuzzy logic controller, Genetic Algorithm based Economic Dispatch.

**Text Books:**

1. S. N. Sivanandam and S. N. Deepa “Principles of – Soft Computing”, Wiley India Edition.2011
2. Rajasekharan and Pai “Neural Networks, “Fuzzy logic, Genetic algorithms: synthesis and applications”, PHI Publications. 2003

**Reference Books:**

1. Satish Kumar “Neural networks”, TMH, 2004.
2. Timothy J. Ross “Fuzzy Logic with Engineering Applications”, Third Edition. 2010 John Wiley & Sons, Ltd.
3. J. S. R. Jang, C. T. Sun and E. Mizutani “Neuro Fuzzy and Soft Computing”, Pearson Education.

**Web References:**

1. <https://www.researchgate.net>
- 2 <https://www.facstaff.bucknell.edu/>
3. <https://www.electrical4u.com>
4. <https://www.audisankara.ac.in>

**E-Text Books:**

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

**Outcomes:**

At the end of the course students able to

1. understand of various neural network and the applications of these models to solve engineering problems
2. Understand various possible applications of Genetic algorithm to electrical engineering field
3. Understanding of optimization using Genetic algorithm
4. Understand various possible applications of fuzzy systems to electrical engineering field
5. Cater the knowledge of Fuzzy Logic Control and use of these for controlling real time systems
6. Understand various possible applications of ANN to electrical engineering field

## ELECTRICAL MATERIALS (OPEN ELECTIVE-II)

<b>B. Tech VI Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE608	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	30	70	100
<b>Contact Classes: 60</b>	<b>Tutorial Classes:-</b>	<b>Practical Classes:-</b>			<b>Total Classes: 60</b>			

### OBJECTIVES

- To affect the economy in manufacturing electrical machines without sacrificing quality, every electrical engineer must have sound knowledge about materials during selection and application.
- To provide knowledge about the conducting materials
- To give knowledge about semiconductor materials
- To give knowledge about the insulating materials and their applications
- To acquire the knowledge about the dielectric materials.

#### UNIT-I CONDUCTING MATERIALS CLASSES:15

**Conducting materials:** Introduction – classification of materials – Metals and Non metals, physical, thermal, mechanical and electrical properties of materials – classification of electrical materials – conductors, general properties of conductors, factors effecting, resistivity of electrical materials electrical/mechanical/thermal properties of copper, aluminium, iron, steel, lead, tin and their alloys – applications

#### UNIT-II: SEMICONDUCTORS AND HIGH RESISTIVITY CONDUCTORS CLASSES:15

##### **Semiconductors and high resistivity conductors:**

Introduction – semiconductor materials – characteristics of semiconductors – atomic structure p Intrinsic and extrinsic semi conductors– Germanium and silicon – doping materials P type and N type crystals – Diode and transistor, their application. High Resistivity materials – electrical / thermal / mechanical properties of Manganin, Constantan, Nichrome, Tungsten, Carbon and Graphite.

#### UNIT-III DIELECTRICS CLASSES:10

Introduction – solid, liquid and gaseous dielectrics, leakage current, permittivity, dielectric constant, dielectric loss – Breakdown voltage and dielectric strength of – solid, liquid and gaseous dielectrics, effect of break down – electrical and thermal effects, Polarisation – electric, ionic and dipolar polarization. Ferro electric materials and their application, piezo electric property, piezo electric materials and their applications

#### UNIT-IV INSULATING MATERIALS CLASSES:10

Introduction – characteristics of a good electrical insulating materials – classification of insulating materials – electrical, thermal, chemical and mechanical properties of solid insulating materials- electrical, Liquid insulating materials -their electrical, thermal and chemical properties – transformer oil – properties – effect of moisture on insulation properties.

Gaseous insulators – classification based on dielectric strength – dielectric loss, chemical stability properties and their applications.

#### UNIT-V MAGNETIC MATERIALS AND SPECIAL PURPOSE MATERIALS CLASSES:10

**Magnetic materials and special purpose materials:**

Introduction – classification of magnetic materials, Ferro magnetism – properties of ferro magnetic materials – B-H curves of soft magnetic materials – losses in magnetic materials – Hysteresis loss – factors affecting permeability and hysteresis loss. Special purpose materials: Soldering materials – properties, materials for hard soldering and soft soldering. Fuse materials – properties of fuse materials- re-wearable fuses, HRC fuses. Contact materials – classification, materials for light and moderately loaded contacts.

**Text Book:**

1. R.K.Rajput , "Electrical engineering Materials", Laxmi Publications

**Reference Books:**

1. G.K. Mithal, "Electrical Engineering Materials", Khanna Publication 2nd Edition.
2. A.J. Dekker, "Electrical engineering Materials", Prentice Hall of India eprinty 2005
3. C.S. Indulkar and S.Thiruvengadam “An Introduction to electrical engineering materials”, S.Chand & Co
4. "Electrical engineering Materials" by T.T.T.I, Madras
5. S.P.Seth, “A course in electrical engineering materials" Dhanapatrai & Sons, New Delhi

**Web References**

1. <https://www.researchgate.net>
2. <https://www.facstaff.bucknell.edu/>
3. <https://www.electrical4u.com>
4. <https://www.audisankara.ac.in>

**E-Text Books**

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

**Outcomes:**

At the end of the course students able to

1. Understand various types of dielectric materials, their properties in various conditions.
2. Evaluate magnetic materials and their behavior
3. Evaluate semiconductor materials and technologies.
4. Acquire Knowledge on Materials used in electrical engineering and applications.
5. Understand the importance of various materials used in electrical engineering and obtain a qualitative
6. Analysis of their behavior and applications.

## ILLUMINATION ENGINEERING (OPEN ELECTIVE-II)

<b>B. Tech VI Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE609	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	2	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: -</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES</b>								
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> <li>1. To get the detailed information about modern lamps and their accessories.</li> <li>2. To get detailed insight of indoor and outdoor illumination system components, its controls and design aspects.</li> <li>3. To know the requirements of energy efficient lighting.</li> <li>4. To introduce the modern trends in the lighting</li> </ol>								
<b>UNIT-I</b>	<b>IMPORTANCE OF LIGHTING IN HUMAN LIFE</b>							<b>CLASSES:12</b>
<p>Optical systems of human eye ,Dependence of human activities on light, performance characteristics of human visual system, External factors of vision-visual acuity, contrast, sensitivity, time luminance, color, visual perception, optical radiation hazards, Good and bad effects of lighting &amp; perfect level of Illumination, Artificial lighting as substitute to natural light, Ability to control natural light, Production of light, physics of generation of light, Properties of light, Quantification &amp; Measurement of Light.</p>								
<b>UNIT-II</b>	<b>LIGHT SOURCES</b>							<b>CLASSES:12</b>
<p><b>Lamp materials:</b> Filament, glass, ceramics, gases, phosphors and other metals and non-metals.  <b>Discharge Lamps:</b> Theory of gas Discharge phenomena, lamp design considerations, characteristics of low and high mercury and Sodium vapor lamps, Low Vapor Pressure discharge lamps – Mercury Vapor lamp, Fluorescent Lamp, Compact Fluorescent Lamp (CFL) ,High Vapor Pressure discharge lamps - Mercury Vapor lamp, Sodium Vapor lamp, Metal halide Lamps, Solid Sodium Argon Neon lamps, SOX lamps, Electro luminescent lamps, Induction lamps</p>								
<b>UNIT-III</b>	<b>INDOOR ILLUMINATION DESIGN</b>							<b>CLASSES:12</b>
<p><b>Indoor Illumination design for following installations</b></p> <ul style="list-style-type: none"> <li>• Residential (Numerical)</li> <li>• Educational institute</li> <li>• Commercial installation</li> <li>• Hospitals</li> <li>• Industrial lighting</li> </ul> <p><b>Special purpose lighting schemes</b></p> <ul style="list-style-type: none"> <li>• Decorative lighting</li> <li>• Theatre lighting</li> <li>• Aquarium, swimming pool lighting</li> </ul>								
<b>UNIT-IV</b>	<b>OUTDOOR ILLUMINATION DESIGN</b>							<b>CLASSES:12</b>

<b>Outdoor Lighting Design:</b> Road classifications according to BIS, pole arrangement, terminology, lamp and luminaires selection, different design procedures, beam lumen method, point by point method, isolux diagram, problems on point by point method.		
<b>Outdoor Illumination design for following installations</b>		
<ul style="list-style-type: none"> <li>• Road lighting (Numerical)</li> <li>• Flood lighting (Numerical)</li> <li>• Stadium and sports complex</li> <li>• Lighting for advertisement/hoardings</li> </ul>		
<b>UNIT-V</b>	<b>MODERN TRENDS IN ILLUMINATION</b>	<b>CLASSES:12</b>
<ul style="list-style-type: none"> <li>• LED luminary designs</li> <li>• Intelligent LED fixtures</li> <li>• Natural light conducting</li> <li>• Organic lighting system</li> <li>• LASERS, characteristics, features and applications, non-lighting lamps</li> <li>• Optical fiber, its construction as a light guide, features and applications</li> </ul>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1.H. S. Mamak, “Book on Lighting”, Publisher International lighting Academy</li> <li>2. Joseph B. Murdoch, “Illumination Engineering from Edison’s Lamp to Lasers” Publisher -York, PA: Visions Communications</li> <li>3. M. A. Cayless, A. M. Marsden, “Lamps and Lighting”, Publisher-Butterworth-Heinemann(ISBN 978-0-415-50308-2)</li> <li>4. Designing with light: Lighting Handbook., Anil Valia; Lighting System 2002</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1.“BIS, IEC Standards for Lamps, Lighting Fixtures and Lighting”, Manak Bhavan, New Delhi</li> <li>2. D. C. Pritchard, “Lighting”, 4th Edition, Longman Scientific and Technical, ISBN 0-582-23422-0.</li> <li>3. “IES Lighting Handbook”, (Reference Volume 1984), Illuminating Engineering Society of North America.</li> <li>4. “IES Lighting Handbook”, (Application Volume 1987), Illuminating Engineering Society of North America</li> <li>5. IESNA lighting Handbook., Illuminating Engineering Society of North America 9th edition 2000</li> <li>6. Applied Illumination Engineering, Jack L. Lindsey FIES (Author), Scott C. Dunning PHD PE CEM (Author) ,ISBN-13: 978-0824748098 ISBN-10: 0824748093, 3rd Edition.</li> <li>7. IS 3646: Part I: 1992, Code of practice for interior illumination.</li> </ol>		
<b>Outcomes:</b>		
At the end of the course students able to		
<ol style="list-style-type: none"> <li>1. Identify the criteria for the selection of lamps and lighting systems for an indoor or outdoor space</li> <li>2. Perform calculations on photometric performance of light sources and luminaires for lighting design</li> <li>3. Evaluate different types of lighting designs and applications</li> <li>4. Understand fundamentals of illumination engineering and architectural lighting design</li> <li>5. Understand lighting fundamentals, measurement, and technology and their application in the analysis and design of architectural lighting systems</li> <li>6. Understand the basic concepts related to Illumination Engineering, Illuminance calculations, optical and exterior lighting design</li> </ol>		

## MICROPROCESSORS AND MICROCONTROLLERS LAB

<b>B. Tech VI Semester: Electronics and communication Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EC513	Core	L	T	P	C	CIA	SEE	TOTAL
		0	0	2	1	25	50	75
<b>Contact Classes:-</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes:</b>			<b>Total Classes: 39</b>			
<p><b>OBJECTIVES:</b></p> <p><b>The course should enable the students to :</b></p> <ol style="list-style-type: none"> <li>1. Write ALP for arithmetic and logical operations in 8086</li> <li>2. Familiarize with MASM, Embedded C &amp; Code composer studio.</li> <li>3. Write and execute programs in 8086 and MSP430</li> <li>4. Analyze the low power modes of operation</li> </ol>								
<p><b>PART A: 8086 MICROPROCESSOR PROGRAMS USING NASM/8086 MICROPROCESSOR KIT.</b></p> <ol style="list-style-type: none"> <li>1. Introduction to MASM Programming.</li> <li>2. Programs using arithmetic and logical operations</li> <li>3. Programs using string operations and Instruction prefix: Move Block, Reverse string, Sorting, Length of the string, String comparison.</li> <li>4. Programs using CALL and RET instructions</li> </ol>								
<p><b>PART B: EMBEDDED C EXPERIMENTS USING MSP430 MICROCONTROLLER</b></p> <ol style="list-style-type: none"> <li>1. Interfacing and programming GPIO ports in C using MSP430 (blinking LEDs , push buttons)</li> <li>2. Usage of Low Power Modes: ( Use MSPEXP430FR5969 as hardware platform and demonstrate the low power modes and measure the active mode and standby mode current)</li> <li>3. Interrupt programming examples through GPIOs</li> <li>4. PWM generation using Timer on MSP430 GPIO</li> <li>5. Interfacing potentiometer with MSP430</li> <li>6. PWM based Speed Control of Motor controlled by potentiometer connected to MSP430 GPIO</li> <li>7. Using ULP advisor in Code Composer Studio on MSP430</li> <li>8. Low Power modes and Energy trace++:             <ol style="list-style-type: none"> <li>a. Enable Energy Trace and Energy Trace ++ modes in CCS</li> <li>b. Compute Total Energy, and Estimated lifetime of an AA battery</li> </ol> </li> </ol>								
<p><b>Web References:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://circuitdigest.com/microcontroller-projects/getting-started-with-msp430-using-code-composer-studio">https://circuitdigest.com/microcontroller-projects/getting-started-with-msp430-using-code-composer-studio</a></li> </ol>								
<p><b>E-Text Books:</b></p> <ol style="list-style-type: none"> <li>1. <a href="http://read.pudn.com/downloads544/ebook/2246231/MSP430_Microcontroller_Basics.pdf">http://read.pudn.com/downloads544/ebook/2246231/MSP430_Microcontroller_Basics.pdf</a></li> </ol>								
<p><b>Outcomes:</b></p> <ol style="list-style-type: none"> <li>1. Execution of different programs for 8086 in Assembly Level Language using MASM Assembler</li> <li>2. Program MSP 430 for various applications.</li> <li>3. Design and implement some specific real time applications</li> <li>4. Program MSP430 in low power modes</li> </ol>								

## SIMULATION OF ELECTRICAL SYSTEMS LAB

<b>B. Tech VI Semester: Electrical and Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
18EE610	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	1	25	50	75
<b>Contact Classes: -</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: 39</b>			<b>Total Classes: 39</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
1. Acquire experience in the usage of standard simulation packages								
2. Elucidate the basic operation of various power semiconductor devices.								
3. Analyze and design rectifier circuits.								
4. Determine stability of a system by using Bode and Nyquist plots								
5. Determine short-circuit studies, Relay operation and load flows in Power System network								
<b>LIST OF EXPERIMENTS</b>								
<b>Expt. 1</b>	<b>SIMULATION OF 3-PHASE POWER SYSTEM NETWORK CONSISTING GENERATOR, TRANSMISSION LINE AND LOAD</b>							
To simulate a 3-Phase Power System Network Consisting Generator, Transmission Line And Load								
<b>Expt. 2</b>	<b>SHORT CIRCUIT STUDIES IN POWER SYSTEMS USING SIMULATION TOOL</b>							
To perform short circuit studies using MATLAB Simulink								
<b>Expt. 3</b>	<b>LOAD FLOW STUDIES USING SIMULATION TOOL</b>							
To perform load flow studies using MATLAB Simulink								
<b>Expt. 4</b>	<b>SIMULATION OF 100W SOLAR PANEL</b>							
To simulate 100W solar panel								
<b>Expt. 5</b>	<b>SIMULATION OF AN AC VOLTAGE CONTROLLER WITH VARIOUS LOADS</b>							
To simulate AC voltage controller using MATLAB Simulink for different loads								
<b>Expt. 6</b>	<b>SIMULATION OF A SINGLE-PHASE/THREE PHASE CYCLOCONVERTERS WITH DIFFERENT LOADS</b>							
To perform simulation of Single-Phase/Three Phase Cycloconverters With Different Loads								
<b>Expt. 7</b>	<b>STATE MODEL REPRESENTATION OF TRANSFER FUNCTIONS USING MATLAB &amp; SIMULINK</b>							
Write a MATLAB code to represent a given transfer function in state space model								
<b>Expt. 8</b>	<b>TRANSFER FUNCTION ANALYSIS OF A GIVEN CIRCUIT USING MATLAB &amp; SIMULINK</b>							
To find time domain specifications for a second order system								

<b>Expt. 9</b>	<b>DESIGN OF CONTROL SYSTEM WITH ROOT-LOCUS METHOD USING MATLAB &amp; SIMULINK</b>
To verify root locus plot for given system function	
<b>Expt. 10</b>	<b>STABILITY ANALYSIS USING BODE, NYQUIST PLOTS</b>
To verify BODE AND NYQUIST plots for a given transfer function	
<b>Expt. 11</b>	<b>SIMULATION OF A RESONANT PULSE COMMUTATION CIRCUIT</b>
To perform simulation of resonant pulse commutation circuit	
<b>Expt. 12</b>	<b>SIMULATION OF SINGLE-PHASE INVERTER WITH PWM CONTROL</b>
To perform simulation of single-phase inverter with PWM control	
<b>Expt. 13</b>	<b>SIMULATION OF A SINGLE-PHASE FULL-BRIDGE CONVERTER WITH DIFFERENT LOADS</b>
To perform simulation of single-phase full bridge converter with different loads	
<b>Expt. 14</b>	<b>STEADY STATE STABILITY ANALYSIS OF POWER SYSTEMS USING SIMULATION TOOL</b>
To perform stability studies	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Grainger, Stevenson, "Power System Analysis", Tata McGraw-Hill, 1<sup>st</sup> Edition, 2010.</li> <li>2. Power Electronics   Devices, Circuits and Applications   Fourth Edition   Pearson by Muhammad H. Rashid   28 November 2017</li> <li>3. Control Systems by NagoorKani Paperback – 1 January 2017 by NagoorKani (Author).</li> </ol>	
<b>Web References:</b>	
<ol style="list-style-type: none"> <li>1. <a href="https://www.ee.iitkgp.ac.in">https://www.ee.iitkgp.ac.in</a></li> <li>2. <a href="https://www.iitm.ac.in">https://www.iitm.ac.in</a></li> </ol>	
<b>LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:</b>	
<b>SOFTWARE:</b> MATLAB	
<b>HARDWARE:</b> 36 No. of Desktop Computers	
<b>Outcomes:</b>	
At the end of the course students able to	
<ol style="list-style-type: none"> <li>1. Impart practical working knowledge of Electrical and Electronics Simulation and Analysis using Mathematical computing languages such as MATLAB</li> <li>2. Develop hands on working experience with reference to Solve, Simulate and Analyze Electrical &amp; Electronics Circuits using MATLAB</li> <li>3. To Solve, Simulate and Analyze basic Electrical and Electronics Circuits and Applications by Writing Ohm's law, KCL and KVL Mathematical Equations and Programs.</li> <li>4. Understand the main features and importance of the MATLAB mathematical programming environment</li> </ol>	

## POWER ELECTRONICS LAB

<b>B. Tech VI Semester: Electrical and Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
18EE611	Core	-	-	2	1	25	50	75
		<b>Contact Classes: -</b>			<b>Tutorial Classes: -</b>		<b>Practical Classes: 39</b>	
<b>OBJECTIVES:</b>								
1. To expose students to operation and characteristics of power semiconductor devices and passive components, their practical application in power electronics.								
2. To provide practical exposure to operating principles, design and synthesis of different power electronic converters.								
3. To introduce students to industrial control of power electronic circuits as well as safe electrical connection and measurement practices								
<b>LIST OF EXPERIMENTS</b>								
<b>Expt. 1</b>	<b>STATIC CHARACTERISTICS OF SCR</b>							
To study Static characteristics of SCR								
<b>Expt. 2</b>	<b>STATIC CHARACTERISTICS OF MOSFET &amp; IGBT</b>							
To study Static Characteristics of MOSFET & IGBT								
<b>Expt. 3</b>	<b>GATE TRIGGERING METHODS FOR SCRS' (R, R-C)</b>							
To Study Gate triggering methods for SCRs' (R, R-C)								
<b>Expt. 4</b>	<b>SINGLE PHASE HALF WAVE CONTROLLED RECTIFIER WITH R, &amp; R-L LOAD (WITH AND WITHOUT FEEDBACK DIODE)</b>							
To study Single phase half wave controlled rectifier with R & R-L load (With and without feedback diode)								
<b>Expt. 5</b>	<b>SINGLE PHASE HALF CONTROLLED RECTIFIER WITH R, &amp; R-L LOAD (WITH AND WITHOUT FEEDBACK DIODE)</b>							
To study Single phase half controlled rectifier with R & R-L load (With and without feedback diode)								
<b>Expt. 6</b>	<b>CHARACTERISTICS OF SINGLE – PHASE SERIES INVERTER</b>							
To study Characteristics of Single – phase series inverter								
<b>Expt. 7</b>	<b>CHARACTERISTICS OF SINGLE - PHASE PARALLEL INVERTER WITH R &amp; R-L LOADS</b>							
To study Characteristics of Single - phase parallel inverter with R & R-L loads								
<b>Expt. 8</b>	<b>CHARACTERISTICS OF SINGLE - PHASE CYCLOCONVERTER (CENTRE TAPPED)</b>							
To study Characteristics of Single-phase cyclo converter (Centre tapped)								
<b>Expt. 9</b>	<b>SINGLE PHASE AC VOLTAGE CONTROLLER WITH R &amp; RL LOADS</b>							
To study Single Phase AC Voltage Controller With R & RL Loads								

<b>Expt. 10</b>	<b>SINGLE PHASE FULL WAVE CONTROLLED RECTIFIER WITH R,&amp; R-L LOAD (WITH AND WITHOUT FEEDBACK DIODE)</b>
To study Single phase full wave controlled rectifier with R & R-L load (With and without feedback diode)	
<b>Expt. 11</b>	<b>SPEED CONTROL OF UNIVERSAL MOTOR BY USING HALF CONTROLLED 1-PHASE BRIDGE CONVERTER/ 1-PHASE AC REGULATOR.</b>
To study Speed control of Universal motor by using half controlled 1-phase bridge converter/ 1-phase AC regulator.	
<b>Expt. 12</b>	<b>BUCK-BOOST CONVERTERS</b>
To study Buck-boost converters	
<b>Expt. 13</b>	<b>MATLAB SIMULATION OF SINGLE PHASE FULLY CONTROLLED RECTIFIER WITH R &amp; R-L, R-L-E LOADS.</b>
To develop MATLAB simulation of single phase fully controlled rectifier with R & R-L, R-L-E loads.	
<b>Expt. 14</b>	<b>MATLAB SIMULATION OF SINGLE PHASE STEP DOWN CYCLOCONVERTER (CENTRE TAPPED)</b>
To develop MATLAB simulation of single phase step down cyclo converter (Centre tapped)	
<b>Expt. 15</b>	<b>MATLAB SIMULATION OF 3-PHASE PWM INVERTER</b>
To develop MATLAB simulation of 3-phase PWM inverter	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Power Electronics By P. S. Bimbhra, Khanna Publications.</li> <li>2. Power electronics By M D Singh and K B Khanchandani by TMH publication 2 edition.</li> </ol>	
<b>Web References:</b>	
<ol style="list-style-type: none"> <li>1. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a></li> <li>2. <a href="https://www.researchgate.net">https://www.researchgate.net</a></li> </ol>	
<b>Course Home Page</b>	
<b>SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS</b>	
<b>SOFTWARE:</b> MATLAB 2017a	
<b>HARDWARE:</b> Desktop Computers (05 nos)	
<b>Outcomes:</b>	
At the end of the course students able to	
<ol style="list-style-type: none"> <li>1. Demonstrate the characteristics of power semiconductor devices.</li> <li>2. Design firing circuit for Thyristors</li> <li>3. Analyze the operation of converters.</li> <li>4. Develop power semiconductor circuits to electrical power system</li> </ol>	

## TERM PAPER

<b>B.Tech VI Semester: Electrical and Electronics Engineering</b>								
<b>Course Code</b>	<b>Category</b>	<b>Hours / Week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
<b>18EE612</b>	<b>-</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>Total</b>
		<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>0</b>	<b>50</b>	<b>50</b>
<b>Contact Classes: 24</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes: -</b>		<b>Total Classes: 24</b>		
<p><b>OBJECTIVES:</b>  <b>The course should enable the students to:</b></p> <ol style="list-style-type: none"> <li>1 Guide students through the process of planning and executing a substantial project.</li> <li>2 Allow students the opportunity to teach themselves.</li> <li>3 Improves the power of designing, organizing, communication, coordination and judgment.</li> </ol>								
<p>The Term Paper is a self study report and shall be carried out either during 5<sup>th</sup> Semester along with other lab courses. Every student will take up this term paper individually and submit a report. The scope of the term paper could be an exhaustive literature review choosing any engineering concept with reference to standard research papers or an extension of the concept of earlier course work in consultation with the term paper supervisor. The term paper reports submitted by the individual students during the 5<sup>th</sup> Semester shall be evaluated for a total of 50 marks for external evaluation, it shall be conducted by two Examiners, one of them being term paper supervisor as internal examiner and an external examiner nominated by the Principal from the panel of experts recommended by HOD.</p>								
<p><b>Outcomes:</b></p> <ol style="list-style-type: none"> <li>1. Prepare comprehensive report based on literature survey related to considered area</li> <li>2. Select the paper to be solved and analyze the extension possibilities</li> <li>3. Identify the applicability of modern software tools and technology</li> <li>4. Correct himself to improve write-up skills</li> <li>5. Exhibit the professional behavior</li> </ol>								

## PROFESSIONAL SOCIETY ACTIVITIES-IV

<b>B. Tech VI Semester – Electrical and Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
18AS601	-	L	T	P	C	CIA	SEE	Total
		2	-	-	0	-	-	-
<b>Contact Classes: 12</b>		<b>Tutorial Classes: Nil</b>		<b>Practical Classes: Nil</b>		<b>Total Classes: 12</b>		
<p><b>OBJECTIVES:</b>  <b>The course should enable the students to:</b></p> <ol style="list-style-type: none"> <li>1. Improve communication skills</li> <li>2. Develop leadership qualities</li> </ol> <p>Professional Society Activities (PSA) course is aimed at enhancing the self-learning, communication, managerial skills of the students by engaging them in various Co &amp; Extra Curricular activities during their course of study. Activities in each of the department shall be designed and conducted by the Professional Society Executive Committee whose composition is:</p> <ol style="list-style-type: none"> <li>1. Faculty Mentors- 2 No.</li> <li>2. Student Chairman: 1 No.- Final year Student</li> <li>3. Student General Secretary: 1 No.- Third year Student</li> <li>4. Treasurer: 1 No.- Third year Student</li> </ol> <p>Student Members: 2 No's from each class            PSA related activities would be of the following nature but not limited to:</p>								
Activity#1	Just A Minute							
Activity#2	Technical Quiz							
Activity#3	Open House- Lab Demo							
Activity#4	Technical Paper Presentation- Preliminary							
Activity#5	Technical Paper Presentation- Final							
Activity#6	Poster Presentation							
Activity#7	Collage- A theme based event							
Activity#8	Debate Competition							
Activity#9	Group Discussion Competition							
Activity#10	Mock Interviews							
Activity#11	Model Exhibition							
Activity#12	Valedictory Function							
<p><b>Outcomes:</b></p> <ol style="list-style-type: none"> <li>1. Attain Oral Presentation skills by answering questions in precise and concise manner</li> </ol>								

2. Evaluate themselves about their knowledge in their domain
3. Gain confidence and inter-personal skills
4. Transforming Engineering Culture to Advance Inclusion and Diversity
5. Apply their knowledge to design engineering models
6. Exhibit the professional behavior

## TECHNICAL APTITUDE

<b>B. Tech VI Semester – Electrical and Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
18AS602	-	L	T	P	C	CIA	SEE	Total
		2	0	0	0	0	0	0
<b>Contact Classes: 36</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes: -</b>		<b>Total Classes: 36</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
1. To ensure that students learn to think critically about mathematical models.								
2. To ensure students in solving problems effectively and accurately.								
3. Application of mathematical or statistical models to different real world contexts.								
<b>UNIT-I</b>							<b>CLASSES:5</b>	
Problem Solving in Commercial Mathematics (Percentages, Profit and Loss, Discount and Interest)								
<b>UNIT-II</b>							<b>CLASSES:5</b>	
Problem Solving in advanced level of Mathematical Ability(Ratio and Proportions, Mixtures, Time and Work, Time and Distance)								
<b>UNIT-III</b>							<b>CLASSES:7</b>	
<b>C - language concepts:</b>								
C language basics, Structure of a C Program, C Tokens, Variables, Constants, C functions, types, recursion, Header files, Preprocessor Commands, Storage CLASSES, Arrays, types of Arrays, Strings, Pointers, Structures.								
<b>UNIT-IV</b>							<b>CLASSES:8</b>	
<b>Data Structures:</b>								
Introduction, Stacks, Queues, types of Queues, Applications of Stacks and Queues, Linked Lists, Search Techniques: Linear Search, Binary Search, Sorting Techniques: Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Trees: basic terminology, Binary Trees, Binary Search Trees.								
<b>UNIT-V</b>							<b>CLASSES:11</b>	
<b>Personality Development-</b> Personal Grooming-Dressing, Body, Language, Leadership Skills, Basic Etiquettes, Mannerism / Confidence Building - Positive Attitude/ Mind Power Training etc								
<b>HR Fundamentals-</b> Practice of self concept.								
<b>Kinds of Interviews</b> –Structured Interview. A structured interview is typically formal and organized and may include several interviewers, commonly referred to as a panel interview. ...								
Unstructured Interview. ...								
Stress Interview. ...								
Behavioral Interview. ...								
Problem Solving or Case Interview. ...								
Panel Interview. Required Key Skills – Corporate culture								
<b>Interview Skills</b> - Mock Interviews [One –One, Panel, Telephonic & Skype]								
<b>Outcomes:</b>								
1. Student can attempt different technical competitive exams.								
2. Student can enhance technical ability and logical thinking.								

## POWER SYSTEM PROTECTION

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE701</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:60</b>		<b>Tutorial Classes: 0</b>		<b>Practical Classes: 0</b>		<b>Total Classes: 60</b>		

<b>OBJECTIVES</b>		
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> <li>Understand types of various circuit breakers</li> <li>Classify relays into various types such as of electromagnetic, static and numerical relays</li> <li>Evaluate the performance of protection schemes of generator and transformer</li> <li>Analyze the performance of feeder and bus-bar protection</li> <li>Discuss the protection schemes against over voltages</li> </ol>		
<b>UNIT-I</b>	<b>CIRCUIT BREAKERS</b>	<b>CLASSES:10</b>
<p>Circuit Breakers: Elementary principles of arc interruption, restriking and recovery voltages, restriking phenomenon, average, maximum and rate of rise of restriking voltage, current chopping and resistance switching, circuit breaker ratings and specifications, , description and operation of various types of circuit breakers, minimum oil circuit breakers, air blast circuit breakers, vacuum and SF6 circuit breakers, numerical problems.</p>		
<b>UNIT-II</b>	<b>ELECTROMAGNETIC AND STATIC RELAYS</b>	<b>CLASSES:15</b>
<p><b>Protective Relaying fundamentals:</b> Introduction – Need for protective systems in a power system – Zones of protection - Primary and backup protection – definition and functional characteristics of a protective relay – operating principles of various electromagnetic relays.  <b>Types of Protective Relays:</b> Over current relays – Directional over current relays – applications of over current relays. Distance relays: the universal torque equation – impedance, reactance and mho relays - differential relays – percentage differential relays – Static relays.</p>		
<b>UNIT-III</b>	<b>SUBSTATIONS AND PROTECTION OF FEEDER / BUS BAR</b>	<b>CLASSES:15</b>
<p>Indoor and outdoor substations: Substations layout, bus bar arrangements like single, sectionalized, main and transfer bus bar system with relevant diagrams; Gas insulated substation (GIS): Types, single line diagram, constructional aspects of GIS, Installation, maintenance, advantages, comparison of GIS with air insulated substations.            Bus bar protection-Protection of Lines- Time graded Over current protection –Differential pilot-wire protection-Distance protection</p>		
<b>UNIT-IV</b>	<b>GENERATOR AND TRANSFORMER PROTECTION</b>	<b>CLASSES:10</b>

**Generator protection:** Protection of generators against stator faults, rotor faults, and abnormal conditions, restricted earth fault and inter turn fault protection, numerical problems on percentage winding unprotected

**Transformer protection:** Percentage differential protections, numerical problem on design of current transformers ratio, Buchholz protection

**UNIT-V PROTECTION AGAINST OVER VOLTAGES**

**CLASSES:10**

**Over voltages in power systems:** Generation of over voltages in power systems, protection against lightning over voltages, valve type and zinc oxide lightning arresters, insulation coordination, basic insulation level,

**Text Books:**

1. BadriRam&D.N.Vishwakarma – Power system protection and switch gear. TMH publishing Company Ltd. 1995.
2. C.L.Wadhwa – Electrical power systems, Wiley Eastern Ltd.
3. B.Ravindranath&M.Chander, power system protection & switch gear., Wiley Eastern Ltd.

**Reference Books:**

1. B L Soni, Gupta, Bhatnagar, Chakrabarthy, “Power System Engineering”, Dhanpat Rai & Co, 3rd Edition, 2007.
2. T S Madhava Rao, “Power System Protection: static relays”, McGraw-Hill Companies, 2nd Edition, 1989.
3. Paithankar, S R Bhide, “Fundamentals of Power System Protection”, PHI, 1st Edition, 2003.
4. VK Mehta, “Principles of power systems”, S Chand Publications, 4th Edition, 2009.

**Web References:**

1. [https://www.eiseverywhere.com/file\\_uploads/aaf42a76a5588f69c7a1348d6f77fe0f\\_Introduction\\_to\\_System\\_Protection-\\_Protection\\_Basics.pdf](https://www.eiseverywhere.com/file_uploads/aaf42a76a5588f69c7a1348d6f77fe0f_Introduction_to_System_Protection-_Protection_Basics.pdf)
2. <https://www.scribd.com/doc/94677925/Protection-and-Switch-Gear-by-U-a-bakshi-and-M-v-bakshi>
3. [https://www.scadec.ac.in/upload/file/psg%20notes\\_opt.pdf](https://www.scadec.ac.in/upload/file/psg%20notes_opt.pdf)
4. [https://www.vssut.ac.in/lecture\\_notes/lecture1425873259.pdf](https://www.vssut.ac.in/lecture_notes/lecture1425873259.pdf)
5. [https://www.en.wikipedia.org/wiki/Power-system\\_protection](https://www.en.wikipedia.org/wiki/Power-system_protection)

**E-Text Books:**

1. <https://www.nptel.ac.in/courses/108103008/>
2. <https://www.freeengineeringbooks.com>
3. <https://www.engr.mun.ca/~hinch/6951/TEXT/DORF.PDF>

**Outcomes:**

At the end of the course students able to

1. Student gains knowledge on different Protective Equipments or Power Systems
2. Know about various protective systems- how it works and where it works
3. Different applications o f the relays, circuit breakers, grounding for different elements of power system is also discussed in the subject.
4. Ability to discuss recovery and Restriking
5. Ability to express Oil circuit Breaker, Air Blast circuit Breakers, SF6 Circuit Breaker.
6. Ability to identify DMT,IDMT type relays

## POWER SYSTEM OPERATION AND CONTROL

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE702	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>		<b>Tutorial Classes:-</b>		<b>Practical Classes: -</b>		<b>Total Classes: 60</b>		

<b>OBJECTIVES</b>		
<p>1. This subject deals with Economic operation of Power Systems, Hydrothermal scheduling and modelling of turbines, generators and automatic controllers.</p> <p>2. It emphasizes on single area and two area load frequency control and reactive power control.</p>		
<b>UNIT-I</b>	<b>ECONOMIC OPERATION OF POWER SYSTEMS</b>	<b>CLASSES:15</b>
<p><b>Economic Operation of Power Systems:</b> Optimal operation of Generators in Thermal Power Stations, - heat rate Curve – Cost Curve – Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected. Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula</p>		
<b>UNIT-II</b>	<b>HYDROTHERMAL SCHEDULING</b>	<b>CLASSES:13</b>
<p><b>Hydrothermal Scheduling:</b> Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, Scheduling problems-Short term hydrothermal scheduling problem.</p>		
<b>UNIT-III</b>	<b>MODELING OF TURBINE &amp; MODELING OF GOVERNOR</b>	<b>CLASSES:10</b>
<p><b>Modeling of Turbine:</b> First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.</p> <p><b>Modeling of Governor:</b> Mathematical Modeling of Speed Governing System – Derivation of small signal transfer function – Block Diagram.</p>		
<b>UNIT-IV</b>	<b>LOAD FREQUENCY CONTROL</b>	<b>CLASSES:12</b>
<p><b>Load Frequency Control –I:</b> Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Load frequency control of 2- area control.</p> <p><b>Load Frequency Control –II:</b> Proportional plus Integral control of single area and its block diagram representation, steady state response – Load Frequency Control and Economic dispatch control.</p>		
<b>UNIT-V</b>	<b>REACTIVE POWER CONTROL</b>	<b>CLASSES:10</b>
<p>Overview of Reactive Power control – Reactive Power compensation in transmission systems – advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation.</p>		

**Text Books:**

1. A. Chakravarthi and S. Halder “Power System Analysis Operation and Control”, 3rd Edition, PHI.2006
2. I.J.Nagrath & D.P.Kothari “Modern Power System Analysis” Tata M Graw – Hill Publishing Company Ltd, 2nd edition. 2003

**Reference Books:**

1. J.Duncan Glover and M.S.Sarma “Power System Analysis and Design”, THOMPSON, 3rd Edition.
2. S. A. Nasar, Schaum’s Outline Series “Electric Power Systems”, Revised 1st Edition, TMH.

**Web References:**

1. <https://www.researchgate.net>
2. <https://www.facstaff.bucknell.edu/>
3. <https://www.electrical4u.com>
4. <https://www.audisankara.ac.in>

**E-Text Books:**

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

**Outcomes:**

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

1. Know basic economic operation of power system including the effect of line losses.
2. Prepare optimal scheduling of thermal and hydro power systems.
3. Model the turbine and speed governing system for computation analysis.
4. Apply the control techniques to determine of power system dynamics and steady state response of the system
5. Apply suitable compensation techniques for reactive power control in transmission line

## INDUSTRIAL AUTOMATION AND CONTROL (OPEN ELECTIVE-III)

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE703	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes:-</b>	<b>Practical Classes:-</b>			<b>Total Classes: 60</b>			

<b>OBJECTIVES</b>		
The course should enable the students to:		
<ol style="list-style-type: none"> <li>1. Lifelong learning through undertaking self-directed studies using various resources, and gaining an appreciation of the rapid technological development in the field of industrial automation.</li> <li>2. Systematic design approach to engineering projects through solving tutorial problems and completing the major assignment</li> </ol>		
<b>UNIT-I</b>	<b>INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLERS</b>	<b>CLASSES:10</b>
Advantages & disadvantages of PLC with respect to relay logic, PLC architecture, Input Output modules, PLC interfacing with plant, memory structure of PLC.		
<b>UNIT-II</b>	<b>PLC PROGRAMMING METHODOLOGIES</b>	<b>CLASSES:10</b>
Ladder diagram, STL, functional block diagram, SFC, Instruction List. Creating ladder diagram from process control descriptions, Introduction to IEC61131 international standard for PLC		
<b>UNIT-III</b>	<b>AUTOMATION SYSTEM STRUCTURE</b>	<b>CLASSES:15</b>
Instrumentation Subsystem, Control Subsystem – HMI in Automation, Human Interface Subsystem, Advance Human Interface System.		
<b>UNIT-IV</b>	<b>INTRODUCTION TO SCADA</b>	<b>CLASSES:10</b>
Data acquisition system, Evolution of SCADA, Communication Technologies, Monitoring and Supervisory Functions.		
<b>UNIT-V</b>	<b>DISTRIBUTED CONTROL SYSTEMS</b>	<b>CLASSES:15</b>
DCS detail engineering, specifications, configuration and programming, functions including database management, reporting, alarm management, communication, third party interface, control, display etc. Enhanced functions viz. Advance Process Control, Batch application, Historical Data Management.		
<b>Text Books:</b>		

1. Richard Shell, Handbook of Industrial Automation, CRC Press, 2000.
2. W.Boldon, 'Programmable logic controllers', 5th Edition, Elsevier India Pvt. Ltd., New Delhi, 2011.
3. Stuart A.Boyer, "SCADA: 'Supervisory control and Data Acquisition', 4th Edition, ISA, 2010.

#### **Reference Books:**

1. G. K. McMillan, Douglas Considine, "Process/Industrial Instruments Hand book", 5th edition, McGraw Hill, New York, 2009.
2. Robert Radvanovsky, Jacob Brodsky, "Handbook of SCADA/Control Systems Security", 2nd edition, CRC press, 2016.
3. John Webb: Programmable Logic Controllers principles & Applications, PHI, 2001.
4. A K Gupta, Industrial Automation and Robotics, Firewall Media, 2007.

#### **Web References:**

1. <https://nptel.ac.in/courses/108/105/108105063/>
2. <https://nptel.ac.in/courses/108/105/108105062/>

#### **E-Text Books:**

1. <https://www.zuj.edu.jo/download/handbook-of-industrial-automation-richard-l-shell-and-ernest-l-hall-pdf/>
2. [https://www.researchgate.net/publication/235237769\\_Handbook\\_Of\\_Industrial\\_Automation](https://www.researchgate.net/publication/235237769_Handbook_Of_Industrial_Automation)

#### **Outcomes:**

At the end of the course students able to

1. Explain block diagram for PLC based automation system with sketch.
2. Interface the input analog and digital devices to PLC
3. Identify Input and Output devices for the given application
4. Summarize functions each component of SCADA system
5. Explain architecture of SCADA system.
6. Describe how PLC can interfacing with SCADA

## ENERGY CONSERVATION (OPEN ELECTIVE-III)

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE704	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes:-</b>	<b>Practical Classes:-</b>			<b>Total Classes: 60</b>			

### OBJECTIVES

The course should enable the students to:

1. To help students gain essential and basic knowledge of various energy forms, its availability and the challenges faced by current way of energy exploitation.
2. To make students understand the common energy using systems or equipment's in commercial and industrial premises.
3. To enable the students to apply the knowledge of engineering thermodynamics, energy conversions etc., to come up with energy saving potentials in industrial systems.

<b>UNIT-I</b>	<b>ENERGY SCENARIO</b>	<b>CLASSES:10</b>
Indian Energy Scenario – Types & Forms of Energy – An overview of energy consumption and its effects – Reasons to save energy (financial and environmental) – Energy Conservation Acts and related policies – Schemes of Bureau of Energy Efficiency (BEE), Recent policies of Government of India in energy sector		
<b>UNIT-II</b>	<b>ELECTRICAL ENERGY USAGE</b>	<b>CLASSES:10</b>
Basics of electrical energy, Electricity Billing – Components & Costs – Determination of kVA demand & Consumption – Time of Day Tariff – Power Factor – Electrical systems – Electric motors.		
<b>UNIT-III</b>	<b>ENERGY EFFICIENCY IN ELECTRICAL UTILITIES</b>	<b>CLASSES:15</b>
Fans & blowers – Compressed air systems – Refrigeration and air conditioning systems -Pumps & pumping systems – Lighting systems – Energy efficient technologies in electrical systems, General energy saving measures.		
<b>UNIT-IV</b>	<b>CO-GENERATION SYSTEMS</b>	<b>CLASSES:10</b>
The energy audit and energy information system, technology for energy conservation, co-generation of process, steam & electricity, computer controlled energy management, commercial options in waste heat recovery equipment, cases of energy studies, energy conservation opportunity, Energy conservation in I. C. Engine.		
<b>UNIT-V</b>	<b>STRATEGIES FOR ELECTRICITY AND MANAGEMENT</b>	<b>CLASSES:15</b>

Setting up an energy management Programme, electricity saving technique by category of end use, Electrical end use in industries, energy & power management in industry, energy management strategies for industry, demand management.

#### **Text Books:**

1. C.B.Smith, Energy Management Principles, Pergamon Press, New York, 1981.
2. K.V Sharma, P Venkateshhaiah (2011) Energy management and Conservation, I.KInternational publishing house New Delhi.

#### **Reference Books:**

1. Y.P abhi, Shashank Jain (2012), Hand book of energy audit and environment management, TERI Press
2. William J Kennedy (2013), Guide to energy management, Lulu.com
3. Giude books(2016), National certification Examination for energy managers and auditors, BEE, [www.em-ea.org](http://www.em-ea.org)

#### **Web References:**

1. <https://nptel.ac.in/courses/112/105/112105221/>
2. <https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-mm17/>

#### **E-Text Books:**

1. [http://books.rediff.com/book/energy-management-and-conservation/9789381141298?sc\\_cid=rediff\\_reco](http://books.rediff.com/book/energy-management-and-conservation/9789381141298?sc_cid=rediff_reco)
2. [https://books.google.co.in/books/about/Energy\\_Management\\_and\\_Conservation.html?id=Ov7JngEACA-AJ&redir\\_esc=y](https://books.google.co.in/books/about/Energy_Management_and_Conservation.html?id=Ov7JngEACA-AJ&redir_esc=y)

#### **Outcomes:**

At the end of the course students able to

1. Know-How of the Theory Energy cycle of the earth & renewable energy sources.
2. Identify the demand supply gap of energy in Indian scenario.
3. Proficiency in Thermodynamics of energy conversion and Study of various parameters for measuring the performance of the output.
4. Competency in the Development of biogas and bio fuels systems.
5. Select appropriate energy conservation method to reduce the wastage of energy.
6. Evaluate the techno economic feasibility of the energy conservation technique adopted.

## OPTIMIZATION TECHNIQUES (OPEN ELECTIVE-III)

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE705	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes:-</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES</b>								
<p>1. To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming</p> <p>2. Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations</p> <p>3. To explain the concept of Dynamic programming and its applications to project implementation.</p>								
<b>UNIT-I</b>	<b>INTRODUCTION AND CLASSICAL OPTIMIZATION TECHNIQUES &amp; CLASSICAL OPTIMIZATION TECHNIQUES</b>						<b>CLASSES:10</b>	
<p><b>Introduction and Classical Optimization Techniques:</b> Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.</p> <p><b>Classical Optimization Techniques:</b> Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.</p>								
<b>UNIT-II</b>	<b>LINEAR PROGRAMMING &amp; TRANSPORTATION PROBLEM</b>						<b>CLASSES:10</b>	
<p><b>Linear Programming:</b> Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm</p> <p><b>Transportation Problem:</b> Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel’s approximation method – testing for optimality of balanced transportation problems.</p>								
<b>UNIT-III</b>	<b>UNCONSTRAINED NONLINEAR PROGRAMMING &amp; UNCONSTRAINED OPTIMIZATION TECHNIQUES</b>						<b>CLASSES:15</b>	
<p><b>Unconstrained Nonlinear Programming:</b> One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method</p> <p><b>Unconstrained Optimization Techniques:</b> Univariate method, Powell’s method and steepest descent method.</p>								
<b>UNIT-IV</b>	<b>CONSTRAINED NONLINEAR PROGRAMMING</b>						<b>CLASSES:10</b>	

**Constrained Nonlinear Programming:** Characteristics of a constrained problem - classification - Basic approach of Penalty Function method - Basic approach of Penalty Function method - Basic approaches of Interior and Exterior penalty function methods - Introduction to convex programming problem.

**UNIT-V DYNAMIC PROGRAMMING**

**CLASSES:15**

**Dynamic Programming:** Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

**Text Books:**

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice by John Wiley and Sons, 4th edition, 2009.
2. H. S. Kasene & K. D. Kumar, Introductory Operations Research, Springer (India), Pvt. Ltd., 2004

**Reference Books:**

1. George Bernard Dantzig, Mukund Narain Thapa, “Linear programming”, Springer series in operations research 3rd edition, 2003.
2. H.A. Taha, “Operations Research: An Introduction”, 8th Edition, Pearson/Prentice Hall, 2007.
3. Kalyanmoy Deb, “Optimization for Engineering Design – Algorithms and Examples”, PHI Learning Pvt. Ltd, New Delhi, 2005.

**Web References:**

1. [https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module\\_1/M1L4slides.pdf](https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_1/M1L4slides.pdf)
2. <https://www3.nd.edu/~jstiver/FIN30210/Lecture%20Slides/Optimization.pptx>

**E-Text Books:**

1. pdfdrive.net
2. [http://mec.nit.ac.ir/file\\_part/master\\_doc/20149281833165301436305785.pdf](http://mec.nit.ac.ir/file_part/master_doc/20149281833165301436305785.pdf)

**Outcomes:**

At the end of the course students able to

1. State the optimization problem
2. Solve optimization problems using linear programming and apply for solving engineering optimization problems
3. Solve optimization problems using nonlinear programming (Hessian and gradient) and apply for solving engineering optimization Problems
4. Solve constrained optimization problems using direct and indirect methods and apply for solving engineering optimization problems
5. Solve optimization problems using dynamic programming and genetic algorithm and apply for solving engineering optimization problems
6. Familiarize Optimization programming tools

## EMBEDDED SYSTEMS (ELECTIVE-II)

<b>B. Tech VII Semester: Electronics and communication Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EC715	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes:-</b>			<b>Total Classes: 60</b>			

### OBJECTIVES:

The course should enable the students to :

- To provide an overview of Design Principles of Embedded System.
- To provide clear understanding about the role of firmware, operating systems in correlation with hardware systems.

#### UNIT-I | INTRODUCTION TO EMBEDDED SYSTEMS | CLASSES:15

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

#### UNIT-II | TYPICAL EMBEDDED SYSTEM | CLASSES:15

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS). Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

#### UNIT-III | EMBEDDED FIRMWARE | CLASSES:10

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages

#### UNIT-IV | RTOS BASED EMBEDDED SYSTEM DESIGN | CLASSES:10

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

#### UNIT-V | TASK COMMUNICATION | CLASSES:10

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

#### Text Books:

- Introduction to Embedded Systems - Shibu K.V, McGraw Hill.
- Embedded Systems - Raj Kamal, MC GRAW HILL EDUCATION
- Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.

#### Reference Books:

- Embedded Systems – Lyla, Pearson, 2013
- An Embedded Software Primer - David E. Simon, Pearson Education.

#### Web References:

- [https://en.wikipedia.org/wiki/Embedded\\_system](https://en.wikipedia.org/wiki/Embedded_system)
- [https://www.researchgate.net/publication/4240547\\_Embedded\\_Systems\\_Integration\\_Using\\_We](https://www.researchgate.net/publication/4240547_Embedded_Systems_Integration_Using_We)

b\_Services

**E-Text Books:**

1. <https://www.electronicsforu.com/resources/eight-free-ebooks-embedded-systems>
2. <https://store.pothi.com/book/ebook-dr-p-gnanasundari-embedded-system-design>
3. <http://read.pudn.com/downloads158/ebook/707037/Embedded%20Systems%20Design%20-%20ed%20-%200750655461.pdf>

**Outcomes:**

1. Expected to understand the selection procedure of Processors in the embedded domain.
2. Design Procedure for Embedded Firmware.
3. Expected to visualize the role of Real time Operating Systems in Embedded Systems.
4. Expected to evaluate the Correlation between task synchronization and latency issues

## UTILIZATION OF ELECTRICAL ENERGY (ELECTIVE-II)

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE706</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:60</b>		<b>Tutorial Classes:-</b>		<b>Practical Classes:-</b>		<b>Total Classes: 60</b>		

<b>OBJECTIVES</b>		
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> <li>1. Understand the performance, importance and applications of Electric Drives.</li> <li>2. Illustrate the mechanism of Electric Traction Systems</li> <li>3. Discuss the methods of Electrical Heating and Welding</li> <li>4. Understand the laws of Illumination and the different types of Illumination techniques</li> </ol>		
<b>UNIT-I</b>	<b>ELECTRIC DRIVES</b>	<b>CLASSES:8</b>
<p><b>Electric Drives:</b> Types of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization and its applications</p>		
<b>UNIT-II</b>	<b>TRAIN MECHANICS</b>	<b>CLASSES:13</b>
<p><b>Train Mechanics:</b> System of electric traction and track electrification, review of existing electric traction systems in India, special features of traction motor, methods of electric braking-plugging, rheostat braking and regenerative braking, mechanics of train movement, speed-time curves for different service: Trapezoidal and quadrilateral speed time curves and its numerical.</p>		
<b>UNIT-III</b>	<b>ELECTRIC TRACTION</b>	<b>CLASSES:12</b>
<p><b>Electric Traction:</b> Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.</p>		
<b>UNIT-IV</b>	<b>ELECTRIC HEATING AND WELDING</b>	<b>CLASSES:14</b>
<p><b>Electric Heating:</b> Elementary principles of heat transfer, Stefan's law, electric furnaces, resistance furnace, design of heating element, losses and efficiency, construction and working of different types of induction furnaces, dielectric heating, arc furnaces, control equipment, induction heating.</p> <p><b>Welding:</b> Types of welding, resistance and arc welding, characteristics of Carbon and metallic arc welding, comparison (Excluding electronic controls).</p>		
<b>UNIT-V</b>	<b>ILLUMINATION</b>	<b>CLASSES:13</b>
<p><b>Illumination:</b> Light production by excitation, Gas discharge lamps, Fluorescent lamps, Ultra violet lamps, Arc lamps, Filament lamps, Polar curves, Effect of voltage variation, Lighting calculations - solid angle and square law methods of calculation, Factory lighting, flood lighting and street lighting, LED lighting.</p>		

**Text Books:**

1. S Sivarnagaraju, D Srilatha, M Balasubbareddy, "Generation and Utilization of Electrical Energy", Pearson Education India, 1st Edition, 2010.
2. E Openshaw Taylor, Orient Longman , "Utilizations of Electric Energy", 1st Edition, 2003.
3. Utilization of Electrical Power by J.B.Gupta, Kataria publisher

**Reference Books:**

1. N V Suryanarayana, "Utilization of Electrical Power including Electric drives and Electric traction New Age International (P) Limited, Publishers, 1st Edition, 1996.
2. C L Wadhwa, "Generation, Distribution and Utilization of electrical Energy", New Age International (P) Limited, 1st Edition,1997.
3. Partab, "Art & Science of Utilization of electrical Energy", Dhanpat Rai & Sons 2nd Edition, 2000.

**Web References:**

1. <https://lecturenotes.in/subject/386/utilization-of-electric-energy-uee>
2. <http://shareurnoteshere.blogspot.com/2015/01/utilisation-of-electrical-power-by-r-k.html>
3. <https://lecturenotes.in/notes/14714-note-for-utilization-of-electric-energy-uee-by-jntu>

**E-Text Books:**

1. <https://www.freebookcentre.net>
2. <https://www.amazon.in/Utilisation-Electrical-Power-R-K-Rajput/dp/8131808297>
3. <https://plus.google.com/+GoogleforgeniustBlogspot1/posts/MuFTRDqJ3iJ>

**Outcomes:**

At the end of the course students able to

1. Impart the knowledge of Electric Traction and Electric heating
2. Analyzing and solving the varieties of problems and issues in electric power utilization
3. Design of interior and exterior lighting systems- illumination levels for various purposes light fittings- factory lighting- flood lighting-street lighting
4. Create awareness of energy conservation
5. Impart the knowledge of Electric welding
6. Impart the knowledge of Illumination

**PLCS AND SCADA (ELECTIVE-II)**

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE707	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: 60</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>		<b>Total Classes: 60</b>		

<b>OBJECTIVES</b>		
<p><b>The course should enable the students to</b></p> <ol style="list-style-type: none"> <li>To understand the construction, operation and installation of PLCs.</li> <li>To provide the knowledge on interfacing the PLCs and field devices with communication protocols.</li> <li>To understand the concepts of SCADA systems.</li> </ol>		
<b>UNIT-I</b>	<b>PLC AND I/O PROCESSING</b>	<b>CLASSES:15</b>
<p>Programmable Logic Controller basics, overview of PLC systems – Architecture of PLC, Principle of Operation, input/output Units – power supplies and isolators, current sinking and current sourcing, types of PLC memory, fundamental PLC wiring diagram, relays, switches, transducers, sensors – seal-in circuits. Input/output units Signal conditioning. Remote connections Networks Processing inputs I/O addresses</p>		
<b>UNIT-II</b>	<b>PROGRAMMING OF PLC</b>	<b>CLASSES:15</b>
<p>Fundamentals of logic, PLC programming languages. Ladder diagrams, Ladder Diagram Instruction, Logic functions, Latching, Multiple outputs. Timer and counter- types along with timing diagrams, shift registers, sequencer function, latch instruction; Arithmetic and logical instruction with various examples. ON/OFF switching devices, I/O analog devices, Analog PLC operation, PID control of continuous processes, simple closed loop systems, closed loop system using Proportional, Integral &amp; Derivative (PID), PLC interface, and Industrial process example.</p>		
<b>UNIT-III</b>	<b>PLC INTERFACE TO VARIOUS CIRCUITS</b>	<b>CLASSES:10</b>
<p>Encoders, transducer and advanced sensors. Measurement of temperature, flow, pressure, force, displacement, speed, level. Developing ladder logic for Sequencing of motors, Tank level control, ON-OFF temperature control, elevator, bottle filling plant, car parking etc. Motors Controls: AC Motor starter, AC motor overload protection, DC motor controller, Variable speed (Variable Frequency) AC motor Drive.</p>		
<b>UNIT-IV</b>	<b>SCADA SYSTEMS</b>	<b>CLASSES:10</b>
<p>Introduction, Communication requirements, Desirable Properties of SCADA system, features, advantages, disadvantages and applications of SCADA. SCADA Architectures (First generation - Monolithic, second generation - Distributed, Third generation – Networked Architecture).</p>		
<b>UNIT-V</b>	<b>INTERFACING OF SCADA WITH PLC</b>	<b>CLASSES:10</b>

SCADA systems in operation and control of interconnected power system, Power System Automation (Automatic substation control and power distribution). Open systems interconnection (OSI) Model, Process Field bus (Profibus). Interfacing of SCADA with PLC. Introduction to Power Management Unit.

#### **Text Books:**

1. Gary Dunning, "Introduction to Programmable Logic Controllers", Thomson, 2nd Edition.
2. John R. Hackworth, Frederick D., Hackworth Jr., "Programmable Logic Controllers Programming Methods and Applications", PHI Publishers.

#### **Reference Books:**

1. Stuart A. Boyer: "SCADA- Supervisory Control and Data Acquisition", Instrument Society of America Publications, USA, The Instrumentation system and Automation Society, 4th Edition, 2010.
2. Gordon Clarke, Deon Reynders" Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems", Newnes An imprint of Elsevier Publications, 1st Edition, 2004
3. Batten G. L., "Programmable Controllers", McGraw Hill Inc., Second Edition
4. Gordon Clark, Deon Reynders, "Practical Modern SCADA Protocols", ELSEVIER
5. P. K. Srivstava, "Programmable Logic Controllers with Applications", BPB Publications
6. John W. Webb, Ronald A. Reis, "Programmable Logic Controllers: Principles and Application", PHI Learning, New Delhi, 5th Edition.
7. Stuart A Boyer, "SCADA supervisory control and data acquisition", ISA, 4th Revised edition
8. L.A. Bryan, E. A. Bryan, "Programmable Controllers Theory and Implementation" Industrial Text Company Publication, Second Edition.

#### **Web References:**

1. <https://www.en.wikipedia.org/wiki/SCADA>
2. <https://www.dosupply.com/tech/2019/02/04/explaining-hmi-scada-and-plcs-what-they-do-and-how-they-work-together/>
3. <https://www.mobileautomation.com.au/plc-industrial-application/>
4. <https://www.watelectronics.com/scada-system-architecture-types-applications/>

#### **E-Text Books:**

1. [http://realbootymusic.aiaiai.dk/gary\\_dunning\\_introduction\\_to\\_programmable\\_logic\\_controllers\\_thomson\\_2nd\\_edition.pdf](http://realbootymusic.aiaiai.dk/gary_dunning_introduction_to_programmable_logic_controllers_thomson_2nd_edition.pdf)
2. [https://www.nfiautomation.org/FREE\\_Download/Technical%20Documents/PLC/%28eBook%29%20%20PLC%20Programming%20Methods.pdf](https://www.nfiautomation.org/FREE_Download/Technical%20Documents/PLC/%28eBook%29%20%20PLC%20Programming%20Methods.pdf)
3. [https://www.etf.ues.rs.ba/~slubura/Procesni%20racunari/Programmable%20Logic%20Controllers%204th%20Edition%20\(W%20Bolton\).pdf](https://www.etf.ues.rs.ba/~slubura/Procesni%20racunari/Programmable%20Logic%20Controllers%204th%20Edition%20(W%20Bolton).pdf)

#### **Outcomes:**

At the end of the course students able to

1. Ability to gain knowledge on Programmable Logic Controllers
2. Understand different types of Devices to which PLC input and output modules are connected
3. Gain the knowledge about understand various types of PLC registers
4. Create ladder diagrams from process control descriptions.
5. apply PLC timers and counters for the control of industrial processes
6. Sketch architecture of SCADA and Describe Major Elements of SCADA

**AVAILABLE MOOCs  
(ELECTIVE-II)**

<b>B. Tech VII Semester:Electrical and Electronics Engineering</b>								
<b>Course code</b>	<b>Category</b>	<b>Hours/week</b>			<b>Credits</b>	<b>Maximum Marks</b>		
<b>18EE708</b>	<b>Elective</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes: -</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>		<b>Total Classes: -</b>		
<p>Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers</p> <p><b>Regulations for MOOCs</b></p> <ul style="list-style-type: none"> <li>➤ The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.</li> <li>➤ Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.</li> <li>➤ A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.</li> <li>➤ The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.</li> <li>➤ Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.</li> <li>➤ There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.</li> <li>➤ Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.</li> </ul>								

## DIGITAL SIGNAL PROCESSING (ELECTIVE-III)

<b>B. Tech VII Semester: Electronics and communication Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EC716	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes:-</b>			<b>Total Classes: 60</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to :</b>								
1. Provide background and fundamental material for the analysis and processing of digital signals. 2. Understand the fast computation of DFT and appreciate the FFT processing. 3. Study the designs and structures of digital IIR filters and analyze and synthesize for a given specifications. 4. Study the designs and structures of digital FIR filters and analyze and synthesize for a given specifications. 5. Acquaint in Multi-rate signal processing techniques. 6. Study the applications of DSP.								
<b>UNIT-I</b>						<b>CLASSES:20</b>		
<b>Introduction:</b> Introduction to digital signal processing: Discrete time signals and sequences, linear shift invariant systems, stability and causality, linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. <b>Discrete Fourier Series:</b> Properties of discrete Fourier series, DFS representation of periodic sequences, discrete Fourier transforms: properties of DFT, linear convolution of sequences using DFT, computation of DFT. Relation between Z-Transform and DFS.								
<b>UNIT-II</b>						<b>CLASSES:10</b>		
<b>Fast Fourier Transforms:</b> Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT and FFT for composite N. <b>Realization of Digital Filters:</b> Review of Z-transforms, applications of Z-Transforms, solution of difference equations of digital filters, block diagram representation of linear constant-coefficient difference equations, basic structures of IIR systems, transposed forms, basic structures of FIR systems, system function.								
<b>UNIT-III</b>						<b>CLASSES:10</b>		
<b>IIR Digital Filters:</b> Analog filter approximations-Butterworth and Chebyshev, design of IIR digital filters from analog filters, design examples: analog-digital transformations, Illustrative Problems.								
<b>UNIT-IV</b>						<b>CLASSES:10</b>		
<b>FIR Digital Filters:</b> Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques, frequency sampling technique, comparison of IIR and FIR filters, Illustrative Problems.								
<b>UNIT-V</b>						<b>CLASSES:10</b>		
<b>Multirate Digital Signal Processing Fundamentals:</b> Basic sample rate alteration devices, Multirate Structures for sampling rate Converters, Multistage design of decimator and Interpolator, Polyphase Decomposition, Nyquist filters. <b>Applications of Digital Signal Processing:</b> Spectral analysis of nonstationary signals, Musical Sound processing, signal Compression, Transmultiplexers, Discrete Multitone Transmission of digital								

data.

**Text Books:**

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 4<sup>th</sup> ed., 2007.
2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata Mcgraw Hill, 3<sup>rd</sup> edition, 2009.
3. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009

**Reference Books:**

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
2. Digital Signal processing – R S Kaler, M Kulkarni,, Umesh Gupta, I K International Publishing House Pvt. Ltd.
3. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008

**Web References:**

1. <https://doku.pub/documents/digital-signal-processing-by-s-salivahananpdf-z0x2wr19rwqn>
2. <https://www.cl.cam.ac.uk/teaching/0809/DSP/>

**E-Text Books:**

1. [https://users.dimi.uniud.it/~antonio.dangelo/MMS/materials/Guide\\_to\\_Digital\\_Signal\\_Process.pdf](https://users.dimi.uniud.it/~antonio.dangelo/MMS/materials/Guide_to_Digital_Signal_Process.pdf)
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007

**Outcomes:**

1. Learn basics of DFT and its computation.
2. Learn design and computation of FFT Radix-2.
3. Design digital IIR and FIR filters.
4. Learn realization of IIR and FIR by considering computational complexity.
5. Learn the concept of multi rate signal processing.
6. Understand the basic applications of DSP.

## WIND AND SOLAR ENERGY SYSTEMS (ELECTIVE-III)

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE709</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:60</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>		<b>Total Classes: 60</b>		

<b>OBJECTIVES</b>		
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> <li>To study different types of generators for wind energy systems.</li> <li>To make the students to understand the importance and applications of Solar Energy and techniques to improve the efficiency of Solar PV system.</li> </ol>		
<b>UNIT-I</b>	<b>BASICS OF WIND RESOURCE ASSESSMENT</b>	<b>CLASSES:10</b>
Introduction, Power in the wind, Wind Characteristics, Measurement of wind using anemometers, Design of rotor, Wind Machine parameters (swept area, power co-efficient, torque co-efficient, thrust, solidity, tip-speed ratio, angle of attack etc.), Power Curve, Energy Estimation, Capacity Factor		
<b>UNIT-II</b>	<b>WIND ENERGY CONVERSION SYSTEMS</b>	<b>CLASSES:10</b>
Types, Components of Modern Wind Turbine (HAWT and VAWT), Fixed and Variable Speed operations, Power Control (Passive stall, Active pitch, Passive pitch and Active stall), Electrical aspects of wind turbine, Safety of wind turbines		
<b>UNIT-III</b>	<b>SOLAR PV CELL FUNDAMENTALS</b>	<b>CLASSES:15</b>
Principle of direct solar energy conversion into electricity in a solar cell - properties - Solar cell and its types - p-n junction, structure- I-V characteristics of a PV module - solar PV modeling and equations - modeling techniques - cell efficiency - fill factor - Applications.		
<b>UNIT-IV</b>	<b>SOLAR PV PLANTS</b>	<b>CLASSES:10</b>
Energy Transfer Power cycles - Tower, Trough and Dish Systems - Concentrating Dish Systems - Concentrating Linear Fresnel Reflectors - Solar Chimneys - Hybrid Systems.		
<b>UNIT-V</b>	<b>MAXIMUM POWER POINT TRACKING</b>	<b>CLASSES:15</b>
Need for Maximum power tracking- - effect of irradiation and temperature on PV characteristics - Tracking techniques and array reconfiguration.		
<b>Text Books:</b>		

1. Wind Energy Fundamentals, Resource Analysis and Economics, Sathyajith Mathew, Springer Publications, ISBN 978-3-540-30906-2, 2006 edition
2. Roger Messenger, Amir Abtahi, “Photovoltaic Systems Engineering”, 3<sup>rd</sup> edition, CRC Press, 2010.
3. D. Yogi Goswami , “Principles of Solar Engineering” 3<sup>rd</sup> Edition, , CRC Press, 2015.

#### **Reference Books:**

1. A Guide to Small Wind Energy Conversion Systems, John Twidell, CAMBRIDGE UNIVERSITY PRESS, 2011, ISBN 10: 0521281628
2. Wind Power, Revised Edition: Renewable Energy for Home, Farm, and Business, Paul Gipe, 2004, Chelsea Green Publishing, ISBN-10: 1931498148.
3. Leon Freris, David Infield, “Renewable energy in power systems”, John Wiley & Sons, 2008.
4. Ali Keyhani, “Design of Smart Power Grid Renewable Energy Systems”, John Wiley & Sons, 2011.

#### **Web References:**

1. <https://nptel.ac.in/courses/108/105/108105058/>
2. <https://nptel.ac.in/courses/108/108/108108078/>

#### **E-Text Books:**

1. [https://www.dolcera.com/wiki/images/Wind\\_power\\_energy.pdf](https://www.dolcera.com/wiki/images/Wind_power_energy.pdf)

#### **Outcomes:**

At the end of the course students able to

1. Understand the Need, importance and scope of non conventional and alternate energy resources
2. Understand role significance of solar energy.
3. Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.
4. Understand the importance of Wind Energy.
5. Explain the principles that underlie the ability of various natural phenomena to deliver solar energy
6. Outline the technologies that are used to harness the power of solar energy

## FLEXIBLE AC TRANSMISSION SYSTEMS (ELECTIVE-III)

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE710</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:60</b>		<b>Tutorial Classes:-</b>		<b>Practical Classes: -</b>		<b>Total Classes: 60</b>		

<b>OBJECTIVES</b>		
The course should enable the students to:		
<ol style="list-style-type: none"> <li>1. Analyse the real and reactive power flow and control in transmission lines</li> <li>2. Analyse voltage source converter based FACTS controllers and their coordination.</li> <li>3. State different compensation techniques through FACTS devices.</li> <li>4. Understand the effect of series and shunt compensation using various FACTS controllers.</li> <li>5. Static VAR compensator for voltage regulation and transient stability enhancement of system.</li> </ol>		
<b>UNIT-I</b>	<b>FACTS CONCEPT</b>	<b>CLASSES:10</b>
Introduction of FACTS Concepts: Transmission line inter connections, Power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, benefits from FACTS controllers.		
<b>UNIT-II</b>	<b>VOLTAGE SOURCE CONVERTERS</b>	<b>CLASSES:10</b>
Voltage Source Converters: Transformer connections for 12, 24 and 48 pulse operation. Three level voltage source converters, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage Source converters.		
<b>UNIT-III</b>	<b>STATIC SHUNT COMPENSATION</b>	<b>CLASSES:15</b>
Static Shunt Compensation: Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable var generation- variable impedance type, static var generators, switching converter type var generators.		
<b>UNIT-IV</b>	<b>SVC AND STATCOM</b>	<b>CLASSES:10</b>
SVC and STATCOM: circuit diagram, principle of operation, working, waveforms / characteristics, dynamic performance, transient Stability enhancement and power oscillation damping.		

UNIT-V	STATIC SERIES COMPENSATION	CLASSES:15
Static Series Compensation: Concept of series capacitive Compensation, improvement of transient stability, power oscillation damping, Basics of GTO Thyristor controlled series capacitor (GSC), Thyristor switched series capacitor (TSSC) and Thyristor controlled series capacitor (TCSC), UPFC, control schemes for GSC, TSSC and TCSC.		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. N.G. Hingorani and L.Guygi, "Understanding FACTS Devices" IEEE Press Publications 2000.</li> <li>2. K R Padiyar," FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd., Publishers, 1st Edition, 2008.</li> <li>3. R. Mohan Mathur and Rajiv K. Varma, "Thyristor-based FACTS controller for electrical transmission system, IEEE series on power Engineering", Wiley Interscience, 2002.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. T. J. E. Miller, "Reactive power control in Electric systems", Wiley-Interscience Publication, John Wiley and sons, 1982.</li> <li>2. A T John, "Flexible AC Transmission System", Institution of Electrical and Electronic Engineers (IEEE), 2nd Edition, 1999</li> <li>3. K Sood, "HVDC and FACTS controllers - Applications of Static Converters in Power System", Kluwer Academic Publishers, 1st Edition, 2004.</li> </ol>		
<b>Web References:</b>		
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/108/107/108107114/">https://nptel.ac.in/courses/108/107/108107114/</a></li> <li>2. <a href="https://www.aar.faculty.asu.edu/CLASSES">https://www.aar.faculty.asu.edu/CLASSES</a></li> <li>3. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a></li> </ol>		
<b>E-Text Books:</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://www.eee.griet.ac.in/document/course%20files/IV-II%20FACTS%20CF.pdf">http://www.eee.griet.ac.in/document/course%20files/IV-II%20FACTS%20CF.pdf</a></li> <li>2. <a href="https://www.freeengineeringbooks.com">https://www.freeengineeringbooks.com</a></li> <li>3. <a href="https://www.jntubook.com/">https://www.jntubook.com/</a></li> </ol>		
<b>Outcomes:</b> At the end of the course students able to <ol style="list-style-type: none"> <li>1. Know the importance of compensation in transmission lines and the concepts of FACTS devices.</li> <li>2. Illustrate the design, modeling and applications of SVC.</li> <li>3. Analyze the different FACTS devices in different stability conditions.</li> <li>4. Learn the operation, modes, modeling and applications of TCSC.</li> <li>5. Study the principle, characteristics, modeling and applications of STATCOM and SSSC.</li> <li>6. Summarize about the importance in coordination of FACTS controllers</li> </ol>		

**AVAILABLE MOOCs  
(ELECTIVE-III)**

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE711	Elective	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: -</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>		<b>Total Classes: -</b>		
<p>Meeting with the global requirements, to inculcate the habit of self learning and in compliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers</p> <p><b>Regulations for MOOCs</b></p> <ul style="list-style-type: none"> <li>➤ The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.</li> <li>➤ Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.</li> <li>➤ A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.</li> <li>➤ The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.</li> <li>➤ Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.</li> <li>➤ There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.</li> <li>➤ Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.</li> </ul>								

## POWER ELECTRONICS AND DRIVES LAB

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
18EE712	Core	L	T	P	C	CIA	SEE	Total
		-	-	3	2	25	50	75
<b>Contact Classes:-</b>	<b>Tutorial Classes: -</b>		<b>Practical Classes: 39</b>			<b>Total Classes: 39</b>		

### OBJECTIVES

The course should enable the students to

1. The main objective of power converters and drives lab is to familiarize the students with latest converters based on power semiconductor devices.
2. This provides the basic practical knowledge in the application of power electronics in electrical drives and machines like thyristorized speed control of DC and AC motors.

### LIST OF EXPERIMENTS

EXP-1	SIMULATION OF 1-PHASE FULLY CONTROLLED BRIDGE CONVERTER WITH R & R-L LOADS
EXP-2	SIMULATION OF 1-PHASE AC VOLTAGE CONTROLLER WITH R & R-L LOADS
EXP-3	SIMULATION OF 1-PHASE FULLY CONTROLLED BRIDGE CONVERTER FED DC MOTOR (SEPARATELY EXCITED) DRIVE
EXP-4	SIMULATION OF 3-PHASE AC VOLTAGE CONTROLLER WITH R & R-L LOADS
EXP-5	SIMULATION OF 3-PHASE FULLY CONTROLLED BRIDGE CONVERTER FED DC MOTOR (SEPARATELY EXCITED) DRIVE
EXP-6	SIMULATION OF SINE- PWM INVERTER
EXP-7	SIMULATION OF BUCK CONVERTER
EXP-8	SIMULATION OF CHOPPER FED DC MOTOR DRIVE
EXP-9	SIMULATION OF AC MOTOR DRIVE WITH SVPWM CONTROL TECHNIQUE
EXP-10	SIMULATION OF DC MOTOR AT DIFFERENT LOAD CONDITIONS
EXP-11	SIMULATION OF THREE PHASE INDUCTION MOTOR AT DIFFERENT LOAD CONDITIONS
EXP-12	SIMULATION OF SPEED CONTROL OF DC MOTOR USING PID CONTROLLER.
EXP-13	SIMULATION OF SPEED CONTROL OF BLDC MOTOR
EXP-14	SIMULATION OF SPEED CONTROL OF 3-PH INDUCTION MOTOR USING PID CONTROLLER

### Reference Books

1. Dr. Shailendra Jain, "Modeling & simulation using matlab & simulink", Wiley India Pvt. Limited.
2. G.K.Dubey "Power semiconductor controlled drives", Prentice Hall PTR.
3. Narain G. Hingorani, Laszlo Gyugyi "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", Wiley, 2000 - Technology & Engineering

### Web References

1. <https://www.ee.iitkgp.ac.in>
2. <https://www.audisankara.ac.in>
3. <https://www.deltaww.com>

### Course Home Page

#### **SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS**

**SOFTWARE:** MATLAB

**HARDWARE:** Desktop Computers (30 nos)

### Outcomes:

At the end of the course students able to

1. correlate theoretical and practical analysis of AC-AC, DC-AC converters
2. perform the experiments on various converters
3. correlate theoretical and practical analysis of converter fed to AC&DC drives
4. control the speed of Dc motor using PID controller

## SIMULATION OF POWER SYSTEMS LAB

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
18EE713	Core	0	0	3	2	25	50	75
<b>Contact Classes:-</b>	<b>Tutorial Classes:-</b>	<b>Practical Classes:39</b>			<b>Total Classes: 39</b>			
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
1.To acquire expertise in usage of modern tools								
2 To analyze the performance of power system networks by conducting various experiments.								
3. To study different power system protective equipment by conducting suitable experiments.								
4.To develop computer programs for analysis of power systems								
<b>List of experiments</b>								
<b>EXP 1</b>	<b>SINUSOIDAL VOLTAGES AND CURRENTS</b>							
To determine sinusoidal voltages and currents using MATLAB								
<b>EXP 2</b>	<b>EQUIVALENT CIRCUIT OF A TRANSFORMER</b>							
To determine the parameters of equivalent circuit of transformer using MATLAB								
<b>EXP 3</b>	<b>ADMITTANCE MATRICES (Y BUS)</b>							
Formation of admittance matrices (Y bus) using MATLAB								
<b>EXP 4</b>	<b>PARAMETERS OF TRANSMISSION LINE</b>							
Computation of parameters of transmission line								
<b>EXP 5</b>	<b>GAUSS-SEIDEL LOAD FLOW ANALYSIS</b>							
Develop MATLAB program for Gauss-Seidel load flow analysis								
<b>EXP 6</b>	<b>NEWTON-RAPHSON LOAD FLOW ANALYSIS</b>							
Develop MATLAB program for Newton-Raphson load flow analysis								
<b>EXP 7</b>	<b>SHORT CIRCUIT ANALYSIS</b>							
To conduct short circuit analysis using MATLAB or POWER WORLD software.								
<b>EXP 8</b>	<b>ECONOMIC LOAD DISPATCH IN POWER SYSTEMS</b>							
To conduct economic load dispatch using MATLAB or POWER WORLD software.								
<b>EXP 9</b>	<b>LOAD – FREQUENCY CONTROL OF SINGLE AREA POWER SYSTEMSWITH AND WITHOUT PI CONTROLLER</b>							
Simulink modeling for Load – frequency control of single area power systems								
<b>EXP 10</b>	<b>LOAD – FREQUENCY CONTROL OF TWO AREA POWER SYSTEMS WITH AND WITHOUT PI CONTROLLER</b>							
Simulink modeling for Load – frequency control of two area power systems								
<b>EXP 11</b>	<b>TRANSIENT STABILITY ANALYSIS OF SMIB</b>							
Simulink modeling for Transient stability analysis of SMIB								
<b>Reference Books:</b>								
1. Dr. Shailendra Jain “Modeling & simulation using matlab & simulink”, Wiley India Pvt. Limited.								
2. D. P. Kothari, I.J. Nagrath “Modern power system analysis”, Tata McGraw-Hill.								
3. Roy Billinton “Power system reliability evaluation”, Taylor & Francis.								
<b>Web References:</b>								
1. <a href="https://www.ee.iitkgp.ac.in">https://www.ee.iitkgp.ac.in</a>								
2. <a href="https://www.audisankara.ac.in">https://www.audisankara.ac.in</a>								

3. <https://www.deltaww.com>

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:**

**SOFTWARE:** MATLAB & power world soft Software

**HARDWARE:** Desktop Computers (40 nos)

**Outcomes:**

At the end of the course students able to

1. Analyze the power system data for load-flow and fault studies
2. Apply computational methods for large scale power system studies
3. Develop software for power system industry
4. Conduct load flow studies
5. Generate switching pluses using SPWM technique in MATLAB environment

## PROJECT WORK PHASE-I

<b>B. Tech VII Semester:Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE714	Core	L	T	P	C	CIA	SEE	TOTAL
		0	0	4	2	50	50	100
<b>Contact Classes:</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes:</b>			<b>Total Classes: 60</b>			
		<b>60</b>						
<p>The object of Project Work Phase-I is to enable the student to take up investigative study in the broad field of his branch of Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the department on an individual basis or three/four students in a group under the guidance of a supervisor/ guide. This is expected to provide a good initiation for the student(s) in R&amp;D work.</p> <p>The assignment normally includes:</p> <ul style="list-style-type: none"> <li>• Survey and Study of published literature of on the assigned topic.</li> <li>• Working out a preliminary approach to the problem relating to the assigned topic.</li> <li>• Conducting preliminary analysis/ modeling/simulation/experiment/ design/ feasibility.</li> <li>• Preparing a written report on the study conducted for presentation to the department.</li> <li>• Final seminar presentation before Project Review Committee.</li> </ul> <p>The supervisor/ guide will evaluate the execution of the project periodically. Project Work Phase-I is allocated 100 marks with 2 credits. Out of 100, 25 marks are allocated for the supervisor/guide to be awarded based on periodical project reviews and submission of the report on the work done. 25 marks are allocated for the supervisor/guide and head of the department to be awarded based on seminar given by each student on the topic of the project. The other 50 marks shall be awarded on the basis of his presentation on the work done on his project by the Departmental committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal. The candidate is declared to have passed in Project work Phase-I when he gets 40% marks given by the Departmental Committee and 50% marks overall</p>								
<ol style="list-style-type: none"> <li>1. Acquire the ability to make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.</li> <li>2. Acquire collaborative skills through working in a team to achieve common goals.</li> <li>3. Learn on their own, reflect on their learning and take appropriate actions to improve it</li> <li>4. Expertize in utilizing the modern tools to address various real time problems</li> <li>5. work as an individual as well as a team member there by maintaining professionalism</li> </ol>								

## COMPREHENSIVE ASSESSMENT

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>18EE715</b>	<b>PC</b>	L	T	P	C	CIA	SEE	Total
		-	-	2	1	100	-	100
<b>Contact Classes: 24</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes: -</b>		<b>Total Classes: 24</b>		
<p><b>OBJECTIVES:</b>  <b>The course should enable the students to:</b></p> <ol style="list-style-type: none"> <li>1. Students able to crack the exams GATE.</li> <li>2. Able to assess the knowledge level of the students.</li> <li>3. Assess the knowledge of the student in the relevant field of Engineering acquired over four years of study.</li> </ol>								
<p>The Comprehensive Assessment will be conducted in VII Semester which will be covering the complete syllabus. Every student will be required to undergo the Comprehensive assessment at the end of the VII semester of B.Tech programme. The duration of the Comprehensive assessment will range from 30 to 45 min. The Examination committee consisting of Head of the Department and two senior faculty members of the department. The Comprehensive assessment shall be evaluated for 100 marks by the committee. There are no external exams for the Comprehensive Assessment.</p>								
<p><b>Outcomes:</b>  <b>At the end of the Programme students are able to</b></p> <ol style="list-style-type: none"> <li>1. Apply the knowledge in exams like Engineering Services and GATE.</li> <li>2. Select the paper to be solved and analyze the extension possibilities</li> <li>3. Identify the applicability of modern software tools and technology</li> <li>4. Correct himself to improve write-up skills</li> <li>5. Exhibit the professional behavior</li> </ol>								

## ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

<b>B. Tech VII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18MD701	Core	L	T	P	C	CIA	SEE	TOTAL
		2	0	0	0	0	0	0
<b>Contact Classes:30</b>		<b>Tutorial Classes: 0</b>		<b>Practical Classes: 0</b>		<b>Total Classes: 30</b>		
<b>OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
1. Understand the concept of Traditional knowledge and its importance								
2. Know the need and importance of protecting traditional knowledge.								
3. Know the various enactments related to the protection of traditional knowledge.								
4. Understand the concepts of Intellectual property to protect the traditional knowledge								
<b>MODULE-I</b>	<b>INTRODUCTION TO TRADITIONAL KNOWLEDGE</b>						<b>CLASSES:6</b>	
Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge.								
<b>MODULE-II</b>	<b>PROTECTION OF TRADITIONAL KNOWLEDGE</b>						<b>CLASSES:6</b>	
Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.								
<b>MODULE-III</b>	<b>LEGAL FRAME WORK AND TK</b>						<b>CLASSES:6</b>	
The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.								
<b>MODULE-IV</b>	<b>TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY</b>						<b>CLASSES:6</b>	
Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.								
<b>MODULE-V</b>	<b>TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS:</b>						<b>CLASSES:6</b>	
Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK. 139.								
<b>Text Books:</b>								
1. Traditional Knowledge System in India, by Amit Jha, 2009.								
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.								
<b>Reference Books:</b>								
1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.								
2. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino								

## ADVANCED ELECTRICAL DRIVES (ELECTIVE-IV)

<b>B. Tech VIII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE801</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:60</b>		<b>Tutorial Classes:-</b>		<b>Practical Classes:-</b>			<b>Total Classes: 60</b>	

### OBJECTIVES

The course should enable the students:

- To impart knowledge about fundamentals of Electric drives and control, operational strategies of dc and ac motor drives as per different quadrant operations and to discuss

<b>UNIT-I</b>	<b>DC MOTOR DRIVE AND ITS OPERATIONAL STRATEGIES</b>	<b>CLASSES:15</b>
Dynamic model of machine with armature voltage control only and converters with continuous conduction only; Closed loop control using single (speed) and two loops (speed, current), Implementation using circulating current type three phase dual converter and four quadrant transistorized chopper.		
<b>UNIT-II</b>	<b>MODELLING AND CONTROL OF DC DRIVES</b>	<b>CLASSES:10</b>
State feedback control and sliding mode control of separately excited DC machine, Modeling and control of separately excited DC machine in field weakening region and discontinuous converter conduction mode, Control of DC series machine.		
<b>UNIT-III</b>	<b>OPEN-LOOP DYNAMIC PERFORMANCE OF AC &amp; DC DRIVES</b>	<b>CLASSES:10</b>
Starting & reversal time, Energy consumption & energy savings principle. Drives Application Engineering for Fan, Pump, Compressor, Lift-Elevator, Kiln, Winder-Un-Winder, Traction application. Synchronization and master-slave configuration.		
<b>UNIT-IV</b>	<b>AC DRIVES AND ITS OPERATIONAL STRATEGIES</b>	<b>CLASSES:10</b>
Variable frequency operation of three phase symmetrical induction machine, Scalar control methods for constant power an constant torque modes, Vector control of induction machine, Methods of field sensing and estimation, Field orientation methods: Implementation of IRFO scheme using current controlled PWM, VSI and implementation of DSFO scheme using CSI, Performance of vector controlled permanent magnet machine.		
<b>UNIT-V</b>	<b>CONTROL OF PERMANENT MAGNET MACHINE</b>	<b>CLASSES:15</b>
Power Electronics Control of Permanent magnet synchronous machine, Brushless DC machine, Surface permanent magnet machine and interior. Compatibility Of Motor & Drives:Effects of drives on motor - dV/dt, THD, Common Mode Voltage, Shaft Voltage and Bearing Current, Sound & Vibration		

**Text Books:**

1. Mohan, N., Electric Drives: An Integrative Approach, MNPERE(2001).
2. Mohan, N., Advanced Electric Drives: Analysis, Control, and Modeling Using Simulink, MNPERE(2001).
3. Krishnan, R., Electric Motor & Drives: Modeling, Analysis & Control, PHI Pvt. Ltd.(2001).

**Reference Books:**

1. Bose B.K., Modern Power Electronics & AC Drives, PHI Pvt. Ltd.,(2001)
2. Leonard, W., Control of Electric Drives, Springer-Verlag, New York,(1985)
3. Miller, T.J.E., Brushless Permanent Magnet and Reluctance Motor Drives, Oxford Science, Oxford(1989).

**Web References**

1. <https://www.researchgate.net>
2. <https://www.facstaff.bucknell.edu/>
3. <https://www.electrical4u.com>

**Outcomes:**

At the end of the course students able to

1. Acquire the knowledge of selection of drives as per practical operational industrial requirement.
2. Apply their knowledge to prepare control schemes as per different types of motors used in industries.
3. Estimate & solve harmonic and power factor related problems in controlling AC and DC drives.
4. Gain knowledge about fundamentals of Electric drives and control, operational strategies of dc and ac motor drives as per different quadrant operations
5. Design controllers for closed-loop operation of a separately excited DC motor drive with symmetrical optimization technique
6. Implement sine-triangle and Space Vector PWM techniques on analog and digital platforms

## HVDC TRANSMISSION SYSTEMS (ELECTIVE-IV)

<b>B. Tech VIII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE802	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>		<b>Tutorial Classes:-</b>		<b>Practical Classes: -</b>		<b>Total Classes: 60</b>		

### OBJECTIVES

The course should enable the students to:

1. To understand the concept, planning of DC power transmission and comparison with AC Power transmission.
2. To analyze HVDC converters and system control.
3. To analyze harmonics and design of filters.
4. To model and analysis the DC system under study state.

<b>UNIT-I</b>	<b>INTRODUCTION HVDC TRANSMISSION</b>	<b>CLASSES:15</b>
<b>Introduction:</b> DC Power transmission technology – Comparison of AC and DC transmission – Application of DC transmission – Description of DC transmission system – Planning for HVDC transmission – Modern trends in HVDC technology – DC breakers – Operating problems – HVDC transmission based on VSC – Types and applications of MTDC systems.		
<b>UNIT-II</b>	<b>ANALYSIS OF HVDC CONVERTERS</b>	<b>CLASSES:15</b>
Line commutated converter – Analysis of Graetz circuit with and without overlap – Pulse number – Choice of converter configuration – Converter bridge characteristics – Analysis of a 12 pulse converters – Analysis of VSC topologies and firing schemes.		
<b>UNIT-III</b>	<b>CONVERTER AND HVDC SYSTEM CONTROL</b>	<b>CLASSES:10</b>
Principles of DC link control – Converter control characteristics – System control hierarchy – Firing angle control – Current and extinction angle control – Starting and stopping of DC link – Power control – Higher level controllers – Control of VSC based HVDC link.		
<b>UNIT-IV</b>	<b>HARMONICS, FILTERS, REACTIVE POWER CONTROL:</b>	<b>CLASSES:10</b>
<b>Harmonics, Filters, Reactive Power Control:</b> Introduction, generation of Harmonics, AC and DC Filters, Reactive power requirements at steady state, sources of Reactive power static VAR systems.		
<b>UNIT-V</b>	<b>HVDC CABLES</b>	<b>CLASSES:10</b>
Introduction to DC cables – Basic physical phenomenon arising in DC insulation.		
<b>Text Books:</b>		

1. S. Kamakshiah and V. Kamaraju “HVDC Transmission” Tata McGraw-Hill Education.
2. Edward Wilson Kimbark, “Direct Current Transmission”, Vol. I, Wiley interscience, New York, London, Sydney, 1971.
3. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, New Age International (P) Ltd., New Delhi, 1990.

#### Reference Books:

1. Padiyar, K. R., “HVDC power transmission system”, New Age International (P) Ltd., New Delhi, Second Edition, 2010.
2. Kundur P., “Power System Stability and Control”, McGraw-Hill, 1993.
3. Colin Adamson and Hingorani N G, “High Voltage Direct Current Power Transmission”, Garraway Limited, London, 1960.
4. Arrillaga, J., “High Voltage Direct Current Transmission”, Peter Pregrinus, London, 1983.

#### Web References:

1. <https://www.nptel.ac.in/syllabus/108103008/>
2. <https://www.sciencedirect.com/science/book/9780123744982>
3. <https://www.springer.com/us/book/9781846280559>

#### E-Text Books:

1. <https://www.nptel.ac.in/courses/108103008/>
2. <https://www.freeengineeringbooks.com>
3. <https://www.engr.mun.ca/~hinch/6951/TEXT/DORF.PDF>

#### Outcomes:

At the end of the course students able to

1. Develop the knowledge of HVDC transmission and HVDC converters and the applicability and advantage of HVDC transmission over conventional AC transmission.
2. Formulate and solve mathematical problems related to rectifier and inverter control methods and learn about different control schemes as well as starting and stopping of DC links
3. Analyze the different harmonics generated by the converters and their variation with the change in firing angles.
4. Develop harmonic models and use the knowledge of circuit theory to develop filters and assess the requirement and type of protection for the filters.
5. Study and understand the nature of faults happening on both the AC and DC sides of the converters and formulate protection schemes for the same.
6. Review the existing HVDC systems along with MTDC systems and their controls and recognize the need to follow the advancements in both the existing systems and HVDC systems and determine the most economic coexistence of both.

## INDUSTRIAL ELECTRICAL SYSTEMS (ELECTIVE-IV)

<b>B. Tech VIII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE803	EEE	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>		<b>Tutorial Classes:-</b>		<b>Practical Classes:-</b>		<b>Total Classes: 60</b>		

### OBJECTIVES

The course should enable the students to:

1. Understand basic concepts of load and drive interaction,
2. Apply speed control concepts of AC and DC drives
3. Understand concepts of speed reversal, regenerative braking aspects
4. Gain the knowledge of energy saving in electric drives

<b>UNIT-I</b>	<b>INTRODUCTION TO ELECTRIC DRIVES</b>	<b>CLASSES:10</b>
Fundamentals of Electric Drive dynamics- Stator and Rotor-Power and Torque-Efficiency-Typical Operating Conditions-Speed Control of Electrical Motors-Reversing-Torque Control-Dynamic braking-Motor Heating and Thermal monitoring.		
<b>UNIT-II</b>	<b>SIZING AND SELECTION OF CONVERTERS</b>	<b>CLASSES:10</b>
Direct Converters-Converters with Intermediate Circuit-Inverter Modulation Principles-Converter Rating from Motor Specification-Overload Capacity-Control Range-Derating factor-Regenerative Energy.		
<b>UNIT-III</b>	<b>CONTROL OF DC DRIVES</b>	<b>CLASSES:15</b>
Conventional methods of DC motor speed control, single phase and three phase controlled DC drives-four quadrant operation-Chopper fed DC drives-Braking and speed reversal-Closed-loop control of DC Drives-Design of controllers.		
<b>UNIT-IV</b>	<b>SCALAR &amp; VECTOR CONTROL OF AC DRIVES</b>	<b>CLASSES:10</b>
Scalar Control with Compensation - Servo Control – Voltage Vector Control Space Vector Control-Flux Vector Control – Direct torque control – Sensor less control		
<b>UNIT-V</b>	<b>ENERGY SAVING IN ELECTRIC DRIVES</b>	<b>CLASSES:15</b>
Classification of Energy Efficiency - Energy Efficient Motor starting and control- Load over Time - Applications with Variable and Constant Torque - Life Cycle Costs and System Savings Using Regenerated Power		
<b>Text Books:</b>		

1. Bimal K Bose, “Modern Power Electronics and AC Drives”, Pearson Education Asia, 2012.
2. R. Krishnan, “Electric Motor Drives- Modelling, Analysis and Control”, Prentice Hall Inc.,2008.

#### **Reference Books:**

1. Gopal K dubey, “Fundamentals of Electrical Drives”, CRC Press, Second Edition, 2015.
2. Werner Leonard, “Control of Electric Drives", Springer Verlag, 2012.
3. Haitham Abu-Rub, Atif Iqbal, Jaroslaw Guzinski, “High Performance Control of AC Drives with Matlab/Simulink Models”, John Wiley & sons, 2012.

#### **Web References:**

1. <https://www.technotraining.ie/course/industrial-electrical-systems-6n5377-qqi-level-6/>

#### **E-Text Books:**

1. <https://www.cgaspirants.com/2018/03/fundamentals-of-electrical-drives-gopal.html>
2. <https://www.pdfdrive.com/modern-power-electronics-and-ac-drives-e18928858.html>

#### **Outcomes:**

At the end of the course students able to

1. Gain knowledge on various methods of effectively and efficiently utilizing Electrical Energy for different and desired applications
2. Gain knowledge on effective utilization of Electrical Drives, Electrical Traction and Electro Mechanical process
3. Understand the basics about electrical equipment’s in manufacturing
4. Apply electrical equipment’s in different types of industries
5. Understand industry-oriented consumption of electrical energy
6. Understand the concepts of speed control of AC and DC drives

**AVAILABLE MOOCs  
(ELECTIVE-IV)**

<b>B. Tech VIII Semester:Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE804	Elective	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: -</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>		<b>Total Classes: -</b>		
<p>Meeting with the global requirements, to inculcate the habit of self learning and in compliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers</p> <p><b>Regulations for MOOCs</b></p> <ul style="list-style-type: none"> <li>➤ The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.</li> <li>➤ Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.</li> <li>➤ A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.</li> <li>➤ The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.</li> <li>➤ Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.</li> <li>➤ There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.</li> <li>➤ Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.</li> </ul>								

## DIGITAL CONTROL SYSTEMS (ELECTIVE-V)

<b>B. Tech VIII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE805</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes:60</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>			<b>Total Classes: 60</b>	

<b>OBJECTIVES</b>		
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> <li>1. Understand analog to digital and digital to analog conversion techniques.</li> <li>2. Illustrate Z transform techniques for solving difference equations.</li> <li>3. Apply state space analysis to determine the stability of digital control systems.</li> <li>4. Design discrete time control system based on frequency response method.</li> </ol>		
<b>UNIT-I</b>	<b>SAMPLING AND RECONSTRUCTION</b>	<b>CLASSES:10</b>
<p>Introduction, examples of data control systems, digital to analog conversion and analog to digital conversion, sample and hold operations.</p>		
<b>UNIT-II</b>	<b>SYSTEM RESPONSE</b>	<b>CLASSES:10</b>
<p>The z-transforms: Introduction, linear difference equations, pulse response, z-transforms, theorems of z-transforms, the inverse z-transforms, modified z-transforms; Z-plane analysis of discrete time control system: Z-Transform method for solving difference equations, pulse transforms function, block diagram analysis of sampled data systems, mapping between s-plane and z-plane.</p>		
<b>UNIT-III</b>	<b>STATE SPACE ANALYSIS</b>	<b>CLASSES:15</b>
<p>State space representation of discrete time systems, pulse transfer function matrix solving discrete time state space equations, state transition matrix, properties, methods for computation of state transition matrix, discretization of continuous time state space equations.</p> <p>Controllability and observability: Concepts of controllability and observability, tests for controllability and observability, duality between controllability and observability, controllability and observability conditions for pulse transfer function.</p>		
<b>UNIT-IV</b>	<b>STABILITY ANALYSIS</b>	<b>CLASSES:10</b>
<p>Mapping between the s-plane and z-plane, primary strips and complementary strips, constant frequency loci, constant damping ratio loci, stability analysis of closed loop systems in the z-plane, Jury stability test, stability analysis by the use of the bilinear transformation and Routh stability criterion.</p>		
<b>UNIT-V</b>	<b>DESIGN OF DISCRETE TIME CONTROL SYSTEM</b>	<b>CLASSES:15</b>

Design of discrete time control system by conventional methods: Transient and steady state response analysis, design based on the frequency response method, bilinear transformation and design procedure in the w plane, lead, lag and lead lag compensators and digital PID controllers; State feedback controllers and observers: Design of state feedback controller through pole placement, necessary and sufficient conditions, Ackerman's formula, state observers, full order and reduced order observers.

#### **Text Books:**

1. B C Kuo, "Digital Control Systems", Oxford University Press, 2nd Edition, 2007.
2. K Ogata, "Discrete Time Control Systems", Prentice Hall, 2nd Edition, 1995.
3. M Gopal, "Digital Control and State Variable Methods", Tata McGraw-Hill, 2nd Edition, 2003.

#### **Reference Books:**

1. K Warwick, D Rees, "Industrial Digital Control Systems", Peter Peregrines Ltd. 2nd Edition, 1988.
2. K J Astroms and B. Wittenmark, "Computer Controlled Systems - Theory and Design", Prentice Hall, 3rd Edition, 1997.
3. Richard C Dorf, Robert H. Bishop, "Modern Control Systems", Pearson Education inc., 1st Edition, 2008.

#### **Web References:**

1. <https://www.nptel.ac.in/syllabus/108103008/>
2. <https://www.sciencedirect.com/science/book/9780123744982>
3. <https://www.springer.com/us/book/9781846280559>

#### **E-Text Books:**

1. <https://www.nptel.ac.in/courses/108103008/>
2. <https://www.freeengineeringbooks.com>
3. <https://www.engr.mun.ca/~hinch/6951/TEXT/DORF.PDF>

#### **Outcomes:**

At the end of the course students able to

1. Distinguish the specific characteristics and differences of discrete/digital, hybrid and analog systems
2. Transform an analog system to discrete and vice versa
3. Analyze the behavior of a discrete system in time domain and in frequency domain
4. Design and synthesize controllers that will be implemented using digital hardware
5. Apply digital control systems' principles and techniques to discrete or continuous time systems
6. Gain through the lab part of the course, practical experience of the analysis and the design of control systems' applications in the discrete domain

## SMART GRID TECHNOLOGIES (ELECTIVE-V)

<b>B. Tech VIII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
<b>18EE806</b>	<b>EEE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CIA</b>	<b>SEE</b>	<b>TOTAL</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>
<b>Contact Classes: 60</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>		<b>Total Classes: 60</b>		

### OBJECTIVES

The course should enable the students to:

1. Architecture designs
2. Measurement and Communications Technologies
3. To familiarize the transmission and distribution automation using smart Grid.
4. Integration of vehicles with rechargeable batteries in to distribution networks.

<b>UNIT-I</b>	<b>SMART GRID ARCHITECTURAL DESIGNS</b>	<b>CLASSES:10</b>
Introduction. Evolution of electric Grid, Need for smart grid, difference between Conventional grid and smart grid, General View of the Smart Grid Market Drivers, Functions of Smart Grid Components, present development and international policies in smart grid.		
<b>UNIT-II</b>	<b>SMART GRID COMMUNICATIONS AND MEASUREMENT TECHNOLOGY</b>	<b>CLASSES:10</b>
Communication and Measurement , Monitoring, PMU, Smart Meters, and Measurements Technologies ,Wide Area Monitoring Systems (WAMS), Phasor Measurement Units (PMU) , Smart Meters , Smart Appliances, Advanced Metering Infrastructure (AMI),, GIS and Google Mapping Tools Multi agent Systems (MAS) Technology ,Multi agent Systems for Smart Grid Implementation, Micro grid and Smart Grid Comparison		
<b>UNIT-III</b>	<b>TRANSMISSION AUTOMATION</b>	<b>CLASSES:15</b>
Introduction, Transmission Infrastructure functionality, Transmission technology , Energy Management System , Map Board Automatic Generation Control (AGC) ,Supervisory Control ,Contingency Reserve Management ,Interchange Scheduling , SCADA Master Terminal Unit ,Transmission Substations, Synchrony phasor as IEDs , Relays as IEDs ,Programmable Logic Controllers		
<b>UNIT-IV</b>	<b>DISTRIBUTION AUTOMATION</b>	<b>CLASSES:10</b>
Introduction , Distribution System Architecture, Distribution automation, working of Distribution Automation, ,role of Smart Grid Function of Distribution Automation, Importance of the Distribution System and Its Security Challenges ,Securing the Distribution System, Distribution Management Systems		
<b>UNIT-V</b>	<b>INTEGRATION OF VEHICLES WITH RECHARGEABLE BATTERIES INTO DISTRIBUTION NETWORKS</b>	<b>CLASSES:15</b>

The revolution of individual electrical transport, consequences on the electrical network. Demand management and vehicle-to-grid, Vehicles as “active loads” Energetic services,. Frequency regulation.

### **Text Books:**

1. James momoh, "Smart grid fundamentals of design and analysis, "IEEE Press, a johnwiley& sons, inc., publication, 2012.
2. Bernd M. Buchholz, Zbigniew Styczynski , "Smart grid fundamentals and Technologies in Electricity Networks", Springer ,Heidelberg New York Dordrecht London, 2014.

### **Reference Books:**

1. Janaka Ekanayake, Nick Jenkis, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama," Smart grid technology and applications,,: Wiley, 2012.
2. Stuart Borlase " Smart grid: Infrastructure, Technology and solutions, "CRC Press 2012.

### **Web References:**

1. <https://nptel.ac.in/courses/108/107/108107113/>
2. <http://www.digimat.in/nptel/courses/video/108107113/108107113.html>

### **E-Text Books:**

<https://www.engineeringbookspdf.com/smart-grid-fundamentals-of-design-and-analysis-by-james-momoh/>

### **Outcomes:**

At the end of the course students able to

1. Explain the smart grids components and architecture
2. Describe different measuring methods and sensors used in smart grid
3. Summarize various renewable energy technologies
4. Interpret the role of batteries and energy storages
5. Summarize the importance of Electric Vehicles in smart grid
6. Understand the various measurement technologies in smart grid

## POWER SYSTEM RELIABILITY (ELECTIVE-V)

<b>B. Tech VIII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE1807	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>		<b>Tutorial Classes:-</b>		<b>Practical Classes: -</b>		<b>Total Classes: 60</b>		

### OBJECTIVES

1. In this course reliability analysis of generating system, effects on transmission lines and reliability analysis of distribution system for radial and parallel configurations will be studied.

<b>UNIT-I</b>	<b>GENERATING SYSTEM RELIABILITY ANALYSIS -1</b>	<b>CLASSES:15</b>
---------------	--	-------------------

**Generating System Reliability Analysis-1:** Generation planning, Capacity outage probability tables- various aspects of system planning and extension. Generation system model – Capacity outage probability tables–Recursive relation for capacitive model building–Sequential addition method–Unit removal

<b>UNIT-II:</b>	<b>GENERATING SYSTEM RELIABILITY ANALYSIS-2</b>	<b>CLASSES:15</b>
-----------------	---	-------------------

**Generating System Reliability Analysis-2:** Evaluation of loss of load and energy indices-Frequency and Duration methods–Evaluation of equivalent transitional rates of identical and non-identical units–Evaluation of cumulative probability and cumulative frequency of non-identical generating units

<b>UNIT-III</b>	<b>BULK POWER SYSTEM RELIABILITY EVALUATION</b>	<b>CLASSES:10</b>
-----------------	---	-------------------

**Bulk Power System Reliability Evaluation:** Basic configuration– Conditional probability approach–System and load point reliability indices– Weather effects on transmission lines–Weighted average rate and Markov model – Common mode failures.

<b>UNIT-IV</b>	<b>DISTRIBUTION SYSTEM RELIABILITY ANALYSIS – I</b>	<b>CLASSES:10</b>
----------------	---	-------------------

**Distribution System Reliability Analysis – 1 (Radial Configuration):** Basic Techniques–Radial networks – Evaluation of Basic reliability indices, performance indices – Load point and system reliability indices–Customer oriented, loss and energy-oriented indices.

<b>UNIT-V</b>	<b>DISTRIBUTION SYSTEM RELIABILITY ANALYSIS – 2</b>	<b>CLASSES:10</b>
---------------	---	-------------------

**Distribution System Reliability Analysis - 2 (Parallel Configuration):** Basic techniques – Inclusion of bus bar failures, scheduled maintenance – Temporary and transient failures – Weather effects – Common mode failures – Evaluation of various indices

### Text Books

- Roy Billiton and Ronald N. Allan, “Reliability Evaluation of Power Systems”, Plenum Press, New York and London, 2nd Edition, 1996.
- J. Endrenyi, “Reliability Modeling in Electric Power Systems”, John Wiley & Sons, 1st Edition, 1978.

### Reference Books

1. Roy Billiton Ronald N.Allan “Reliability Evaluation of Power Systems”.
2. J.Endrenyi “Reliability Modeling in Electric Power Systems”.

### Web References

1. <https://www.researchgate.net>
2. <https://www.facstaff.bucknell.edu/>
3. <https://www.electrical4u.com>
4. <https://www.audisankara.ac.in>

### E-Text Books

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

### Outcomes:

At the end of the course students able to

1. Understand the importance of maintaining reliability of power system components
2. Apply the probabilistic methods for evaluating the reliability of generation and transmission systems
3. Assess the different models of system components in reliability studies.
4. Assess the reliability of single area and multi area systems.
5. Describe merging generation and load models
6. Apply various indices for distribution systems

**AVAILABLE MOOCs  
(ELECTIVE-V)**

<b>B. Tech VIII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE808	Elective	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: -</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>		<b>Total Classes: -</b>		
<p>Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers</p> <p><b>Regulations for MOOCs</b></p> <ul style="list-style-type: none"> <li>➤ The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.</li> <li>➤ Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.</li> <li>➤ A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.</li> <li>➤ The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.</li> <li>➤ Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.</li> <li>➤ There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.</li> <li>➤ Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.</li> </ul>								

## VLSI DESIGN (ELECTIVE-VI)

<b>B. Tech VIII Semester: Electronics and communication Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EC813	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes:-</b>			<b>Total Classes: 60</b>			

### OBJECTIVES:

The course should enable the students to :

1. Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors and passive components.
2. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit
4. Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics
5. Provide design concepts to design building blocks of data path of any system using gates.
6. Understand basic programmable logic devices and testing of CMOS circuits.

#### UNIT-I

**CLASSES:20**

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &BiCMOS Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit  $\omega_0$ ; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

#### UNIT-II

**CLASSES:10**

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2  $\mu$ m CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

#### UNIT-III

**CLASSES:10**

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

#### UNIT-IV

**CLASSES:10**

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters. Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories

#### UNIT-V

**CLASSES:10**

Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design. CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

#### Text Books:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, EshraghianDouglas and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.

3. VLSI Design – M. Michael Vai, 2001, CRC Press.

**Reference Books:**

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K .Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
5. Introduction to VLSI – Mead & Convey, BS Publications, 2010.

**Web References:**

1. <https://www3.nd.edu/~kogge/courses/cse40462-VLSI-fa18/www/links.html>
2. <https://www.eetimes.com/indian-vlsi-group-cites-dearth-of-design-skills/>

**E-Text Books:**

1. <https://nptel.ac.in/courses/117/101/117101058/>
2. <https://www.freebookcentre.net/Electronics/VLSI-Books-Download.html>

**Outcomes:**

1. Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
2. Choose an appropriate inverter depending on specifications required for a circuit
3. Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit
4. Design different types of logic gates using CMOS inverter and analyze their transfer characteristics
5. Design simple memories using MOS transistors and can understand design of large memories.
6. Design simple logic circuit using PLA, PAL, FPGA and CPLD.

## ELECTRICAL MATERIALS (ELECTIVE-VI)

<b>B. Tech VIII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE809	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes:60</b>		<b>Tutorial Classes: -</b>		<b>Practical Classes:-</b>		<b>Total Classes: 60</b>		

<b>OBJECTIVES</b>		
<ol style="list-style-type: none"> <li>1. To effect the economy in manufacturing electrical machines without sacrificing quality, every electrical engineer must have sound knowledge about materials during selection and application.</li> <li>2. To provide knowledge about the conducting materials</li> <li>3. To give knowledge about semiconductor materials</li> <li>4. To give knowledge about the insulating materials and their applications</li> <li>5. To acquire the knowledge about the dielectric materials.</li> </ol>		
<b>UNIT-I</b>	<b>CONDUCTING MATERIALS</b>	<b>CLASSES:15</b>
<p><b>Conducting materials:</b> Introduction – classification of materials – Metals and Non metals, physical, thermal, mechanical and electrical properties of materials – classification of electrical materials – conductors, general properties of conductors, factors effecting, resistivity of electrical materials electrical/mechanical/thermal properties of copper, aluminium, iron, steel, lead, tin and their alloys – applications</p>		
<b>UNIT-II:</b>	<b>SEMICONDUCTORS AND HIGH RESISTIVITY CONDUCTORS</b>	<b>CLASSES:15</b>
<p><b>Semiconductors and high resistivity conductors:</b> Introduction – semiconductor materials – characteristics of semiconductors – atomic structure p Intrinsic and extrinsic semi conductors– Germanium and silicon – doping materials P type and N type crystals – Diode and transistor, their application. High Resistivity materials – electrical / thermal / mechanical properties of Manganin, Constantan, Nichrome, Tungsten, Carbon and Graphite.</p>		
<b>UNIT-III</b>	<b>DIELECTRICS</b>	<b>CLASSES:10</b>
<p>Introduction – solid, liquid and gaseous dielectrics, leakage current, permittivity, dielectric constant, dielectric loss – Breakdown voltage and dielectric strength of – solid, liquid and gaseous dielectrics, effect of break down – electrical and thermal effects, Polarisation – electric, ionic and dipolar polarization. Ferro electric materials and their application, piezo electric property, piezo electric materials and their applications</p>		
<b>UNIT-IV</b>	<b>INSULATING MATERIALS</b>	<b>CLASSES:10</b>
<p>Introduction – characteristics of a good electrical insulating materials – classification of insulating materials – electrical, thermal, chemical and mechanical properties of solid insulating materials- electrical, Liquid insulating materials -their electrical, thermal and chemical properties – transformer oil – properties – effect of moisture on insulation properties . Gaseous insulators – classification based on dielectric strength – dielectric loss, chemical stability properties and their applications.</p>		
<b>UNIT-V</b>	<b>MAGNETIC MATERIALS AND SPECIAL PURPOSE MATERIALS</b>	<b>CLASSES:10</b>

**Magnetic materials and special purpose materials:**

Introduction – classification of magnetic materials, Ferro magnetism – properties of ferro magnetic materials – B-H curves of soft magnetic materials – losses in magnetic materials – Hysterisis loss – factors affecting permeability and hysteresis loss.Special purpose materials:Soldering materials – properties, materials for hard soldering and soft soldering.Fuse materials – properties of fuse materials- re-wirable fuses, HRC fuses.Contact materials – classification, materials for light and moderately loaded contacts.

**Text Book:**

1. R.K.Rajput , "Electrical engineering Materials", Laxmi Publications

**Reference Books:**

1. G.K. Mithal, "Electrical Engineering Materials", Khanna Publication 2nd Edition.
2. A.J. Dekker, "Electrical engineering Materials", Prentice Hall of India eprinty 2005
3. C.S. Indulkar and S.Thiruvengadam “An Introduction to electrical engineering materials”,S.Chand & Co
4. "Electrical engineering Materials" by T.T.T.I, Madras
5. S.P.Seth, “A course in electrical engineering materials" Dhanapatrai & Sons, New Delhi

**Web References**

1. <https://www.researchgate.net>
2. <https://www.facstaff.bucknell.edu/>
3. <https://www.electrical4u.com>
4. <https://www.audisankara.ac.in>

**E-Text Books**

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

**Outcomes:**

At the end of the course students able to

1. Understand various types of dielectric materials, their properties in various conditions.
2. Evaluate magnetic materials and their behavior
3. Evaluate semiconductor materials and technologies.
4. Acquire Knowledge on Materials used in electrical engineering and applications.
5. Understand the importance of various materials used in electrical engineering and obtain a qualitative analysis of their behavior and applications.
6. Predict the behavior of any electrical and magnetic circuits.

**B. Tech VIII Semester: Electrical and Electronics Engineering**

Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P		CIA	SEE	TOTAL
18EE810	EEE	3	0	0	3	30	70	100
<b>Contact Classes: 60</b>	<b>Tutorial Classes:-</b>	<b>Practical Classes:-</b>			<b>Total Classes: 60</b>			

**OBJECTIVES**

- To introduce students to different aspects of power plant engineering.
- To familiarize the students to the working of power plants based on different fuels.
- To expose the students to the principles of safety and environmental issues.

**UNIT-I INTRODUCTION TO THE SOURCES OF ENERGY CLASSES:14**

Introduction: Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant. Power plant economics and selection.

**UNIT-II STEAM POWER PLANT CLASSES:12**

Plant Layout, Working of different Circuits, Fuel and handling equipment, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems. Combustion Process: Properties of coal — overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

**UNIT-III DIESEL POWER PLANT CLASSES:12**

Internal Combustion Engine Plant: DIESEL POWER PLANT: Introduction — IC Engines, types, construction— Plant layout with auxiliaries — fuel supply system, air starting equipment, lubrication and cooling system — super charging. Gas Turbine Plant: Introduction — classification — construction — Layout with auxiliaries — Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison. Direct Energy Conversion: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

**UNIT-IV HYDRO ELECTRIC POWER PLANT CLASSES:12**

Water power — Hydro logical cycle / flow measurement — drainage area characteristics — Hydro graphs — storage and Pounding — classification of dams and spill ways. Hydro Projects And Plant: Classification — Typical layouts — plant auxiliaries — plant operation pumped storage plants. Power From Non-Conventional Sources: Utilization of Solar- Collectors- Principle of Working, Wind Energy — types — HAWT, VAWT Tidal Energy.

UNIT-V	SOLAR AND WIND ENERGY	CLASSES:10
<p><b>Solar Energy:</b> Introduction, The Sun as Source of Energy, The Earth, Sun, Earth Radiation Spectrum, Extraterrestrial and Terrestrial Radiations, Spectral Power Distribution of Solar Radiation, Depletion of Solar Radiation.</p>		
<p><b>Wind Energy:</b> Introduction, Basic Principles of Wind Energy Conversion, History of Wind Energy, Wind Energy Scenario – World and India. The Nature of the Wind, The Power in the Wind, Forces on the Blades, Wind Energy Conversion, Wind Data and Energy Estimation, Site Selection Considerations</p>		
<p><b>Text Books:</b></p>		
<ol style="list-style-type: none"> <li>1. Power Plant Engineering! P.C.Sharma / S.K.Kataria Pub.</li> <li>2. A Course in Power Plant Engineering: I Arora and S. Domkundwar.</li> </ol>		
<p><b>Reference Books:</b></p>		
<ol style="list-style-type: none"> <li>1. A Text Book of Power Plant Engineering I Rajput I Laxmi Publications.</li> <li>2. Power Plant Engineering: P.K.Nag/ II Edition /TMH.</li> <li>3. An Introduction to Power Plant Technology I G.D. Rai/Khanna Publishers.</li> <li>4. Power plant Engg I Elanchezhian/ I.K. International Pub.</li> <li>5. Power plant Engineering! Ramalingam / Sciotech Publishers.</li> </ol>		
<p><b>Web References</b></p>		
<ol style="list-style-type: none"> <li>1. <a href="https://www.researchgate.net">https://www.researchgate.net</a></li> <li>2. <a href="https://www.facstaff.bucknell.edu/">https://www.facstaff.bucknell.edu/</a></li> <li>3. <a href="https://www.electrical4u.com">https://www.electrical4u.com</a></li> </ol>		
<p><b>Outcomes:</b> At the end of the course students able to</p> <ol style="list-style-type: none"> <li>1. Describe and analyze different types of sources and mathematical expressions related to thermodynamics and various terms and factors involved with power plant operation.</li> <li>2. Analyze the working and layout of steam power plants and the different systems comprising the plant and discuss about its economic and safety impacts.</li> <li>3. Combine concepts of previously learnt courses to define the working principle of diesel power plant, its layout, safety principles and compare it with plants of other types.</li> <li>4. Describe the working principle and basic components of the nuclear power plant and the economic and safety principles involved with it.</li> <li>5. Discuss the working principle and basic components of the hydro electric plants and the economic principles and safety precautions involved with it.</li> <li>6. Discuss and analyze the mathematical and working principles of different electrical equipments involved in the generation of power.</li> </ol>		

**AVAILABLE MOOCs  
(ELECTIVE-VI)**

<b>B. Tech VIII Semester:Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE811	Elective	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	30	70	100
<b>Contact Classes: -</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes:-</b>			<b>Total Classes: -</b>			
<p>Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers</p> <p><b>Regulations for MOOCs</b></p> <ul style="list-style-type: none"> <li>➤ The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.</li> <li>➤ Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.</li> <li>➤ A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.</li> <li>➤ The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.</li> <li>➤ Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.</li> <li>➤ There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.</li> <li>➤ Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.</li> </ul>								

**PROJECT WORK PHASE-II**

**B. Tech VIII Semester: Electrical and Electronics Engineering**

Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
18EE812	Core	0	0	20	10	60	140	200
<b>Contact Classes:</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: 75</b>			<b>Total Classes: 75</b>			

**Internal Evaluation for Major Project Work:**

The project Phase-II shall be carried out during the 8<sup>th</sup> Semester in the **Non FSI Model** and shall be evaluated for 200 marks out of which 100 marks for internal evaluation and 100 marks for semester end evaluation. Project Work Phase-II will be taken up batch wise and batches will be continued as per Project Work Phase-I. The object of project work phase-II is to enable the student to extend further investigative study taken up as the project work phase-I under the guidance of the supervisor/guide from the department.

*The assignment normally includes:*

- Final development of product/process, testing, results, conclusions and further direction.
- Preparing a paper for conference presentation/ publication in journal if possible.
- Preparing a dissertation in the standard format for being evaluated by the department.
- Final presentation of the work done before the Project Review Committee (PRC).

Project Work Phase-II is allocated 60 internal marks. Out of 60, 30 marks are allocated for the supervisor/guide and head of the department to be evaluated based on two seminars given by each student on the topic of the project. The other 30 marks shall be evaluated on the basis of his presentation on the work done on his project by the Departmental Committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.

**External Evaluation for Project Phase-I:**

The Project work Phase-II shall be carried out during the 8<sup>th</sup> Semester in the **Non FSI Model** and shall be evaluated for 200 marks. The Semester End Examination for major project work done during 8<sup>th</sup> Semester and for 140 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be conducted at the end of the 8<sup>th</sup> Semester. The above committee evaluates the project work report with weightages of 50% of the marks (50 marks) awarded by external examiner, 20% of marks (20 marks) awarded by HOD & 30% of the marks (30 marks) by Project Guide/Supervisor respectively for a total of 100 marks. Of the 40 marks for Presentation & Viva-Voce examination, HOD evaluates for 10 marks and external examiner for 30 marks. The evaluation of 140 marks is distributed as given below:

**Distribution of Project Work Marks**

Sl. No.	Criterion	Marks
1	Report	100
2	Presentation & Viva – Voce	40

A candidate shall be declared to have passed in major project if he secures a minimum of 50% aggregate marks (100 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (70 marks) in the Project Work Phase-II end examination.

**FULL SEMESTER INTERNSHIP (FSI)**

<b>B. Tech VIII Semester: Electrical and Electronics Engineering</b>								
Course code	Category	Hours/week			Credits	Maximum Marks		
18EE814	Core	L	T	P	C	CIA	SEE	TOTAL
		0	0	40	19	200	300	500
<b>Contact Classes:</b>	<b>Tutorial Classes: -</b>	<b>Practical Classes: 800</b>			<b>Total Classes: 800</b>			
<b>Full Semester Internship (FSI)</b>								
Full Semester Internship (FSI) programme carries 19 credits with 800marks. During the FSI, student has to spend one full semester in an identified industry /firm / organization and has to carry out the internship as per the stipulated guidelines of that industry / firm / organization and the institute.								
<b>Internal Evaluation for Full Semester Internship:</b>								
Internship course is 200 marks for continuous internal assessment and will be evaluated based on day to day assessment by concern industry.								
<b>Following are the evaluation guidelines:</b>								
➤ Profile and abstract –Student has to submit the industry profile and abstract of the project within four weeks from date of commencement of internship through mail or post. Weightage: 40 Marks								
➤ Seminar 1 - at 9 <sup>th</sup> week from date of commencement of internship – weightage: 50 Marks								
➤ Seminar 2 - Pre submission at 17 <sup>th</sup> week from date of commencement of internship – Weightage: 50 Marks								
➤ Internship Diary, weightage: 60 Marks								
<b>External Evaluation of Full Semester Internship:</b>								
Full Semester Internship programme carries 19 credits. During Internship, student has to spend one full semester in an identified industry /firm / organization and has to carry out the internship as per the stipulated guidelines of that industry / firm / organization and the institute.								
<b>Following are the evaluation guidelines:</b>								
➤ Project Report, weightage: 60 Marks								
➤ Final Presentation, weightage: 160 Marks								
➤ Viva-voce, weightage: 80 Marks								
The internship shall be evaluated for 500 marks out of which 200 marks for internal evaluation and 300 marks for external evaluation.								
The external evaluation based on the report submitted and viva-voce exam for 300 marks by a committee comprising the HOD, Project supervisor and external examiner (Industry/ Academia). A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.								
FSI shall be open to all the branches in the VII semester. The selection procedure is:								
➤ Choice of the students CGPA (> 7.5) upto IV semester with no current arrears and maintains the CGPA of 7.5 till VI Semester.								