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 & ELECRONICS ENGINEERING

B.Tech Regular Four Year Degree Programme

(For the batches admitted from the academic year 2016 - 2017)

B.Tech (Lateral Entry Admission)

(For the batches admitted from the academic year 2017 - 2018)

FAILURE TO READ AND UNDERSTAND THE REGULATIONS

IS NOT AN EXCUSE

S. No	Description
1	Preliminary Definitions and Nomenclatures
2	Foreword
3	Choice Based Credit System
4	Eligibility for Admission
5	Duration of Programme
6	Medium of Instruction
7	Semester Structure
8	Registration
9	Unique Course Identification Code
10	Curriculum and Course Structure
11	Division of marks for Internal and External Assessment
12	Evaluation Methodology
13	Grading Procedure
14	Award of Class
15	Conduct of Semester End Examinations and Evaluation
16	Supplementary Examinations
17	Attendance Requirements and Detention Policy
18	Promotion Rules
19	Graduation Requirements
20	Revaluation
21	Temporary Break of Study from the Programme
22	Termination from the Program
23	With-holding of Results
24	Student Transfers
25	Graduation Day

26 Conduct and Discipline

27 Grievance Redressal Committee

28 Transitory Regulations

29 Revision of Regulations and Curriculum

30 Program Outcomes

31 Frequently asked Questions and Answers About Autonomy

32 Malpractices Rules

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 for academic excellence where 21st century innovative minds manage with novel ideas & spreadout new technologies relevant to the social needs with increased employment opportunities and changed lifestyle.

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 takeon 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: It's a privilege conferred to an institute by UGC following meticulous evaluation process to manage its academic programmes independently for promoting excellence.

Academic Year: An academic year consists of two semesters each lasting 21 weeks i.e., (one odd + one even). It is the period necessary to complete an actual course of study within a year.

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

Autonomous Institute: 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 not cleared and due to which obtained a failure grade (F) in that course.

Basic Sciences: Basic sciences are Mathematics, Physics, Chemistry, English etc., They provide the basic knowledge of all Engineering sciences.

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 to update and design curricula in respect of all the programs offered by the department.

Branch: It's specialization in an Engineering discipline like Electronics & Communication Engineering, Computer Science & Engineering, Electical & Electronics Engineering, Mechanical Engineering, Civil 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.

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

Continuous Internal Examination: It's an examination that evaluates a student's progress throughout the prescribed course.

Course: A course is a unit of teaching that typically lasts one academic term. Courses explore the practice of teaching from both applied and theoretical perspective.

Course Outcomes: Learning outcomes are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course or program.

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 upto 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: Standardized measurements of achievement in a course. 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.

ASCET: AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY, Gudur, Nellore Dist, Andhra Pradesh.

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: 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: A written representation of 'he or she' used as a neutral alternative to indicate someone of either sex.

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.

JNTUA: 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 followup, 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 graduates 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 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 2016 - 17)

&

B.Tech. (Lateral Entry Scheme)

(For the batches admitted from the academic year 2017 - 18)

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.

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 2nd 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 INSTRCTION

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 fundamentals to learn 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.

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

FIRST SEMESTER (21 weeks)	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
Semester Break and Supplementary Examinations			2 weeks
SECOND SEMESTER (21 weeks)	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
Summer Vacation and Supplementary Examinations			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 intime. The registration will be organized departmentally under the supervision of the Head of the Department.

8.2 INABSENTIA 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;

S. No	Branch	Code
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): 1credit per lecture hour per week.
- Tutorial Classes (Theory): 1credit per 2 lecture hours per week.
- Laboratory Hours (Practical): 1 credit for 2 Practical hours.

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)	2+2	3
3	MOOC Courses	-	3
4	Laboratory Courses/Drawing Courses	3	2
5	Technical Seminar	3	1
6	Term Paper	3	2
7	Mini Project	3	2
8	Internship	3	2
9	Major Project And Comprehensive Viva-Voce	8	12
10	Communication Skills Practice	3	1
11	Soft Skills Practice	3	1
12	Quantitative Aptitude	3	1
13	Technical Aptitude	3	1
14	Professional Society Activities	3	1
15	Full Semester Internship	-	21
16	Audit Course	-	-

10.2 Course Structure

Every program of study shall be designed to have 42 theory courses and 21 laboratory courses. Every course of the B.Tech program will be placed in one of the eight categories with minimum credits as listed in Table 4. In addition, a student has to carry out a mini project, project work and comprehensive examination.

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%)	**13**
2	Basic Sciences (BS) including Mathematics, Physics and Chemistry.	BS (10% to 15%)	**22**
3	Engineering Sciences (ES), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	ES (10% to 15%)	**18**
4	Professional Subjects - Core (PC), relevant to the chosen specialization/branch.	PC (40% to 50%)	**99**
5	Professional Subjects - Electives (PE), relevant to the chosen specialization/branch.	PE (10% to 15%)	**15**
6	Open Subjects - Electives (OE), from other technical and/or emerging subject areas.	OE (01% to 5%)	**03**
7	Project Work and Comprehensive Viva-Voce, Mini Project and Internship	10% to 15%	**16**
8	Technical Seminar, Term Paper, Quantitative Aptitude, Technical Aptitude and Professional Society Activities	CRT	**10**
		TOTAL	**196**

10.3 Semester-wise course break-up

Following are the TWO models of course structure out of which any student shall choose or will be allotted with one model based on their academic performance.

i. Full Semester Internship (FSI) Model and

ii. Non Full Semester Internship (NFSI) Model.

10.4 Four year Regular program (FSI Model):

In the FSI Model, selected/eligible students shall undergo Full Semester Internship in B.Tech 7^{th} Semester. In the Non FSI Model, the remaining students shall carry out the course work and project work as specified in the course structure. A student who secures a minimum CGPA of 7.5 upto 4^{th}

Semester with no backlogs and maintains the CGPA of 7.5 till 6th Semester shall be eligible to opt for FSI

10.5 For Four year regular program (FSI Model):

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
1st Semester	5 Foundation	3	21
2nd Semester	5 Foundation	3	21
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA+Audit Course	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SSP+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	Full Semester Internship (FSI)		21
Total	39	21+TP+TS+Internship+ Mini Project+ CSP+ SSP+ QA+TA+PSA+FSI	196

10.6 For Four year regular programme (Non FSI Model)

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
1st Semester	5 Foundation	3	21
2nd Semester	5 Foundation	3	21
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA+Audit Course	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SSP+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	3 Electives	Major Project +Viva	9+12=21
Total	42	21+TP+TS+Internship+Mini Project + CSP + SSP + QA+TA + PSA+Major Project	196

10.7 For Three year lateral entry program (FSI Model):

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA+Audit Course	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SSP+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	Full Semester Internship (FSI)		21
Total	29	15+TP+TS+Internship+Mini Project+ CSP+ SSP +QA +TA +PSA + FSI	154

10.8 For Three year lateral entry program (Non FSI Model)

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SS+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA+Audit Course	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	3 Electives	Major Project +Viva	9+12=21
Total	32	15+TP+TS+Internship+Mini Project+ CSP +SSP + QA + TA +PSA + Major Project	154

Note: PSA - Professional Society Activities
CSP - Communication Skills Practice
SSP – Soft Skills Practice
TS – Technical Seminar
TP – Term Paper
QA – Quantitative Aptitude
TA - Technical Aptitude

10.9 Course-wise break-up for Four year Regular program (FSI Model):

Total Theory Courses - 39 (36 Foundation and Core + 2 Professional Electives + 1 Open Elective)	39 @ 3credits each	117
Laboratory Courses – 21	21 @ 2 credits each	42
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Full Semester Internship	1 @ 21credit	21
	TOTAL CREDITS	**196**

10.10 Course-wise break-up for Four year Regular program(Non FSI Model)

Total Theory Courses - 42 (36 Foundation and Core + 5 Professional Electives + 1 Open Elective)	42 @ 3credits each	126
Laboratory Courses – 21	21 @ 2 credits each	42
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Major Project and Comprehensive Viva-Voce	1 @ 12credits	12
TOTAL CREDITS		**196**

10.11Course-wise break-up for three year lateral entry program(FSI Model)

Total Theory Courses - 29 (26 Foundation and Core + 2 Professional Electives + 1 Open Elective)	29 @ 3credits each	87
Laboratory Courses – 15	15 @ 2 credits each	30
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Full Semester Internship	1 @ 21credit	21
	TOTAL CREDITS	**154**

10.12 Course-wise break-up for three year lateral entry program (Non FSI Model):

Total Theory Courses - 32 (26 Foundation and Core + 5 Professional Electives + 1 Open Elective)	32 @ 3credits each	96
Laboratory Courses – 15	15 @ 2 credits each	30
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Major Project and Comprehensive Viva-Voce	1 @ 12credits	12
TOTAL CREDITS		**154**

11.0 DIVISION OF MARKS FOR INTERNAL AND EXTERNAL ASSESSMENT

Name of the Course	Continuous Internal Assessment (CIA)	Semester End Examination (SEE)
Theory	40	60
Laboratory	25	50
Technical Seminar	100	-
Term Paper	-	50
Mini Project	25	50
Internship	25	50
Communication Skills Practice	25	25
Soft Skills Practice	-	25
Quantitative Aptitude	-	50
Technical Aptitude	-	50
Professional Society Activities	-	-
Major Project and Comprehensive Viva-Voce	40	160

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 40 marks and 60 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 40 marks with the following distribution.

- 30 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), the second mid-term examination shall be conducted on the remaining 50% of the syllabus (Unit III & Unit-IV).

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 for 5 marks and the second assignment should be conducted after completion of Unit-III for 5 marks. The final Assignment Test marks will be the addition of these two.

Two midterm examinations each for **30 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 x 0.8 + 23 x 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 five two marks questions. Two questions from each unit and a student has to be answered all five questions ($5 \times 2 = 10$ Marks)
- Section-II contains four questions are to be designed taking two questions from each unit and a student has to be answered three questions. ($3 \times 10 = 30$ Marks)
- Then its converted to 30 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 4th 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 100 marks. Technical Seminar component-I for 50 marks and component-II for 50 marks making total 100 marks. (**Distribution of marks for 50:** 10 marks for report, 10 marks for subject content, 20 marks for presentation and 10 marks for queries).

12.8 Internal Evaluation for Communication Skills Practice

For communicational skills practice subject, there shall be a Continuous Internal Assessment 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.

12.9 Mini Project

The Mini Project shall be carried out during 6th Semester along with other lab courses by having regular weekly slots. Students will take mini project batch-wise and the batches will be divided as per the guidelines issued. The topic of mini project should be so selected that the students are enabled to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of mini project could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with specific outcome.

Mini Project report will be evaluated for 75 marks. 25 marks for internal evaluation and 50 marks for external evaluation.

Assessment will be done by the supervisor/guide for 25 marks based on the work and presentation/ execution of the mini project.

The remaining 50 marks is based on report, presentation, execution and viva-voce. Evaluation is done by a committee comprising the mini project supervisor, Head of the Department and external examiner appointed by the Principal from the panel of experts recommended by Chairman, BOS in consultation with Head of the Department.

12.10 Internal Evaluation for Internship

Internship course is 25 marks for continuous internal assessment and will be evaluated based on day-to-day assessment by concern industry.

12.11 Internal Evaluation for Major Project Work: 8th Semester

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks out of which 60 marks for internal evaluation and 140 marks for semester end evaluation. Major project will be taken up batch wise and batches will be divided as per the guidelines. The object of major project is to enable the student to extend further the investigative study takenup as the project in Mini project 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).

Major Project 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.

12.12 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 60 marks.

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

- A total of two Sections (Section-I & Section-II)
- Section-I contains six two mark questions. One question from each unit and a student has to be answered all the six questions compulsory ($6 \times 2 = 12$ Marks)
- Section-II contains eight questions are to be designed taking two questions from each unit (Unit Wise - Either or type) of the total four units. ($4 \times 12 = 48$ Marks)

A student has to secure not less than a minimum of 40% of marks (24 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

12.13 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.

12.14 External Evaluation for Communication Skills Practice

25 marks to be conducted after 10 weeks of training to assess the training outcomes. Semester End Evaluation shall be done for 25 marks by the skilled soft Skill Trainer nominated by the Principal.

A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% aggregate marks (25 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (13 marks) in the semester external examination.

12.15 External Evaluation for Soft Skills Practice

25 marks to be conducted after 10 weeks of training to assess the training outcomes. Semester End Evaluation shall be done for 25 marks by the skilled soft Skill Trainer nominated by the Principal.

A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% marks (13 marks) in the semester external examination.

12.16 External Evaluation for Quantitative Aptitude

The external examination will be conducted for 50 Marks with 1 credit, examination type is Multiple Choice Question (MCQ) – Offline/Online.

12.17 External Evaluation for Technical Aptitude

The external examination will be conducted for 50 Marks with 1 credit, examination type is Multiple Choice Question (MCQ) – Offline/Online.

12.18 External Evaluation for Term Paper

The Term Paper is a self study report and shall be carried out either during 5th 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 5th 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.

12.19 External Evaluation for Major Project

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks. The Semester End Examination for major project work done during 8th 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 8th 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 major project end examination.

12.20 Massive Open Online Courses (MOOCs)

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

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.

12.21 Internship

There shall be 60 hours duration to complete summer internship during summer vacations. The total internal weightage for internship course is 25 marks and will be evaluated based on day to day assessment by concern industry.

The external examination shall be evaluated by the two senior faculties (i.e one faculty act as external examiner and other one as internal examiner) for 50 marks based on the his/her report and presentation.

12.22 Full Semester Internship (FSI)

Full Semester Internship (FSI) programme carries 21 credits. 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.

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: 10%.

- Seminar 1 -at 9^{th} week from date of commencement of internship weightage: 10%
- Seminar 2 -Pre submission at 17^{th} week from date of commencement of internship– Weightage: 10%
- Internship Diary, weightage: 15 %
- Project Report, weightage: 15%
- Viva-voce & Final Presentation, weightage: 40%

The internship shall be evaluated for 200 marks out of which 60 marks for internal evaluation and 140 marks for external evaluation.

The external evaluation based on the report submitted and viva-voce exam for 140 marks by a committee comprising the HOD, Project supervisor and external examiner (Industry/ Academia).A minimum of 60% 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

13.0 GRADING PROCEDURE

Grades will be awarded to indicate the performance of students in each theory subject, laboratory / practicals, Technical Seminar, Term Paper, Mini Project, Communication Skills Practice, Soft Skills Practice, Quantitative Aptitude, Technical Aptitude and Major Project. 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 ³5 ('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.,

$$SGPA = \sum(C_i \times G_i)/\sum C_i$$

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

$$CGPA = \sum(C_i \times S_i)/\sum C_i$$

where "S_i" is the SGPA of the i^{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

1st Semester	2nd Semester	3rd Semester	4th Semester
Credit: 21 SGPA: 8.13	Credit: 21 SGPA: 6.9	Credit: 26 SGPA: 7.3	Credit: 27 SGPA: 6.8
5th Semester	**6th Semester**	**7th Semester**	**8th Semester**
Credit: 28 SGPA: 8.2	Credit: 28 SGPA: 7.4	Credit: 24 SGPA: 7.2	Credit: 21 SGPA: 7.8

Thus, CGPA

$$\frac{(21\times 8.13)+(21\times 6.9)\times(26\times 7.3)+(27\times 6.8)+(28\times 8.2)(28\times 7.2)(24\times 7.2)(21\times 7.8)}{196}$$

=7.432

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 ≥ 7.5	CGPA ≥ 6.5 and < 7.5	CGPA ≥ 5.0 and < 6.5	CGPA ≥ 4.0 and < 5.0	CGPA < 4.0
First Class with Distinction	**First Class**	**Second Class**	**Pass Class**	**Fail**

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 putin 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 In four year B.Tech program, a student shall be promoted from 2nd year to 3rd year only if s/he fulfills the academic requirements and earning of minimum 50% of credits upto 2nd year.

18.2 In four year B.Tech program, a student shall be promoted from 3rd year to 4th year only if s/he fulfills the academic requirements and earning of minimum 50% credits upto 3rd year.

18.3 A student shall register for all the 196 credits and earn all the 196 credits. Marks obtained in all the 196 credits shall be considered for the award of the Grade.

18.4 In three year lateral entry B.Tech program, a student shall be promoted from 3rd year to 4th year only if s/he fulfills the academic requirements and earning of minimum 50% credits upto 3rd year.

18.5 In three year lateral entry, a student shall register for all the 154 credits and earn all the 154 credits. Marks obtained in all the 154 credits shall be considered for the award of the Grade.

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 196 credits for regular program and 154 credits for lateral entry program.

19.2 A student of a regular program, who fails to earn 196 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 154 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 revaluation. Based on the recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation 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

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 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 builtin 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.

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.

$$CGPA = \sum_{j=1}^{m} \left(C_j S_j\right) / \sum_{j=1}^{m} C_j$$

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
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(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.	

Course Structure for

B.Tech (ELECTRICAL & ELECRONICS ENGINEERING)

Regular Programme

Applicable for students admitted from 2016-17 Academic Year

B.Tech 1st Semester – Electrical & Electronics Engineering

S.No	Code	Course	L	T	P	Drg	C
1	16HS1101	Professional English-I	3	0	0	0	3
2	16HS1102	Calculus and Differential Equations	3	1	0	0	3
3	16HS1104	Applied Chemistry	3	1	0	0	3
4	16ME1102	Basic Mechanical and Civil Engineering	3	1	0	0	3
5	16CS1101	Computer Programming	3	0	0	0	3
6	16HS2108	Applied Chemistry Lab	0	0	3	0	2
7	16CS2102	Computer Programming Lab	0	0	3	0	2
8	16ME2103	Engineering Drawing Practice	0	0	0	3	2
	TOTAL		**15**	**3**	**6**	**3**	**21**

B.Tech 2nd Semester – Electrical & Electronics Engineering

S.No	Code	Course	L	T	P	Drg	C
1	16HS1201	Professional English-II	3	0	0	0	3
2	16HS1202	Integral Transformations	3	1	0	0	3
3	16HS1103	Applied Physics	3	1	0	0	3
4	16HS1105	Environmental Studies	3	0	0	0	3
5	16EE1202	Circuit Theory	3	1	0	0	3
6	16HS2106	Professional English Lab	0	0	3	0	2
7	16HS2107	Applied Physics Lab	0	0	3	0	2
8	16ME2104	Engineering Workshop and IT Workshop	0	0	3	0	2
	TOTAL		**15**	**3**	**9**	**0**	**21**

B.Tech 3rd Semester – Electrical & Electronics Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16HS1301	Complex Analysis	3	1	0	0	3
2	16EC1301	Electronic Devices and Circuits	3	1	0	0	3
3	16CS1305	Introduction to Data Structures	3	0	0	0	3
4	16EE1301	Electromagnetic Fields	3	1	0	0	3
5	16EE1302	Network Analysis	3	1	0	0	3
6	16EE1303	DC Machines	3	0	0	0	3
7	16EC2305	Electronic Devices and Circuits Lab	0	0	3	0	2
8	16EE2305	Electrical Circuits Lab	0	0	3	0	2
9	16EE2306	Electrical Workshop	0	0	3	0	2
10	16AS3301	Communication Skills Practice	0	0	0	3	1
11	16AS3302	Professional Society Activities-I	0	0	0	3	1
12		Audit Course					
	TOTAL		**18**	**4**	**9**	**6**	**26**

B.Tech 4th Semester – Electrical & Electronics Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16HS1401	Matrices and Numerical Methods	3	1	0	0	3
2	16ME1302	Fluid Mechanics and Hydraulic Machinery	3	1	0	0	3
3	16EC1405	Digital Electronics	3	0	0	0	3
4	16EC1406	Analog Electronic Circuits	3	1	0	0	3
5	16EE1401	Transformers and Induction Motors	3	1	0	0	3
6	16EE1402	Generation of Electric Power	3	0	0	0	3
7	16ME2306	Fluid Mechanics and Hydraulic Machinery Lab	0	0	3	0	2
8	16EC2408	Pulse and Digital Circuits Lab	0	0	3	0	2
9	16EE2403	DC Machines Lab	0	0	3	0	2
10	16AS3401	Technical Seminar	0	0	0	3	1
11	16AS3402	Soft Skills Practice	0	0	0	3	1
12	16AS3403	Professional Society Activities-II	0	0	0	3	1
	TOTAL		**18**	**4**	**9**	**9**	**27**

B.Tech 5th Semester – Electrical & Electronics Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16MB1411	Engineering Economics and Project Management	3	0	0	0	3
2	16EE1501	Transmission of Electric Power	3	1	0	0	3
3	16EE1502	Synchronous and Special Machines	3	1	0	0	3
4	16EE1503	Linear Control Systems	3	1	0	0	3
5	16EE1504	Power Electronics	3	0	0	0	3
6	16EE1505	Electrical Measurements and Instrumentation	3	1	0	0	3
7	16EE2506	AC Machines Lab	0	0	3	0	2
8	16EE2507	Control Systems Lab	0	0	3	0	2
9	16EE2508	Electrical Measurements and Instrumentation Lab	0	0	3	0	2
10	16AS3501	Term Paper	0	0	0	3	2
11	16AS3502	Quantitative Aptitude	0	0	0	3	1
12	16AS3503	Professional Society Activities-III	0	0	0	3	1
	TOTAL		**18**	**4**	**9**	**9**	**28**

B.Tech 6th Semester – Electrical & Electronics Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16EC1604	Microprocessors and Microcontrollers	3	1	0	0	3
2	16EC1610	Linear and Digital IC Applications	3	1	0	0	3
3	16EE1601	Switch Gear and Protection	3	1	0	0	3
4	16EE1602	Power Semiconductor Drives	3	0	0	0	3
5	16EE1603	Utilization of Electrical Energy	3	0	0	0	3
6	**ELECTIVE-I**						
	16EE1604	High Voltage Engineering	3	1	0	0	3
	16EC1303	Signals and Systems					
	16CS1401	Database Management Systems					
	16EE1605	Available Selected MOOCs					
7	16EC2613	Microprocessors and Microcontrollers Lab	0	0	3	0	2
8	16EE2606	Power Electronics Lab	0	0	3	0	2
9	16EE2607	Electrical Systems Lab	0	0	3	0	2
10	16EE2608	Mini Project	0	0	0	3	2
11	16AS3601	Technical Aptitude	0	0	0	3	1
12	16AS3602	Professional Society Activities-IV	0	0	0	3	1
	TOTAL		**18**	**4**	**9**	**9**	**28**

B.Tech 7th Semester – Electrical & Electronics Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16EC1605	Digital Signal Processing	3	0	0	0	3
2	16EE1701	Power System Analysis	3	1	0	0	3
3	16EE1702	Power System Operation and Control	3	1	0	0	3
4	**ELECTIVE-II (OPEN ELECTIVE)**		3	1	0	0	3
5	**ELECTIVE-III**						
	16EE1703	HVDC and FACTS	3	1	0	0	3
	16EE1704	Neural Networks and Fuzzy logic					
	16EE1705	PLCs and SCADA					
	16EE1706	Available Selected MOOCs					
6	16EC2614	Digital Signal Processing Lab	0	0	3	0	2
7	16EE2709	Power System Lab	0	0	3	0	2
8	16EE2710	Power Electronic Convertors and Drives Lab	0	0	3	0	2
9	16AS3701	Internship	0	0	0	3	2
10	16AS3702	Professional Society Activities-V	0	0	0	3	1
	TOTAL		**15**	**4**	**9**	**6**	**24**

B.Tech 8th Semester – Electrical & Electronics Engineering

S.No	Code	Course	L	T	P	Oth	C
1		**ELECTIVE-IV**					
	16EE1801	Electrical Distribution Systems	3	1	0	0	3
	16EE1802	Optimization Techniques					
	16CS1506	OOPs through JAVA					
	16EC1813	Embedded Systems					
2		**ELECTIVE-V**					
	16EE1803	Modern Control Theory	3	1	0	0	3
	16EE1804	Smart Grid					
	16EE1805	Power System Reliability					
	16EE1806	Available Selected MOOCs					
3		**ELECTIVE-VI**					
	16EE1807	Energy Auditing and Demand Side Management	3	1	0	0	3
	16EE1808	Principles of Power Quality					
	16EE1809	Design of Electrical Systems					
	16EE1810	Available Selected MOOCs					
4	16EE2811	Major Project and Comprehensive Viva-Voce	0	0	8	0	12
		TOTAL	**9**	**3**	**8**	**0**	**21**

ELECTIVE-II (OPEN ELECTIVE)

S.No	Code	Course
1	16CE1707	Disaster Management
2	16CE1708	Infrastructure Systems Planning
3	16EE1707	Renewable Energy Sources
4	16EE1708	Energy Auditing
5	16ME1708	Industrial Robotics
6	16ME1709	Nano Material Applications
7	16EC1707	Digital Image Processing
8	16EC1708	Electronic Product Design and Packaging
9	16EC1709	Bio-Medical Instrumentation
10	16CS1708	Internet of Things
11	16CS1709	Python Programming Language
12	16MB1302	Entrepreneurship Development

B.Tech 5th Semester

ELECTRICAL & ELECRONICS ENGINEERING

Syllabus

ENGINEERING ECONOMICS AND PROJECT MANAGMENT

B.Tech 5th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16MB1411	Core	L	T	P	C	CIA	SEE	TOTAL
		3	0	0	3	40	60	100
Contact Classes:65	Tutorial Classes: 0	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

The course should enable the students to

Prepare engineering students to analyze cost/revenue data and carry out make economic analyses in the decision making process to justify or reject alternatives/projects on an economic basis.

UNIT-I	INTRODUCTION TO MANAGERIAL ECONOMICS& DEMAND ANALYSIS	Classes:15

Introduction to Managerial Economics: Definition, Nature and scope of Managerial Economics.

Demand Analysis: Determinants, Law of demand, Elasticity of demand- Types, Measurement and significance of Elasticity of demand, Demand forecasting- Methods.

UNIT-II	LAW OF SUPPLY, MARKET STRUCTURES & PRODUCTION FUNCTION	Classes:18

Law of supply: Definition, determinants, Elasticity of supply,

Market structures: Types of Markets – Features – Price Out-put determination under Perfect Competition, Monopoly, Monopolistic and Oligopoly, Break even Analysis.

Production Function: ISO quant's and ISO Costs, MRTS, Least cost combination of inputs, economies of scale.

UNIT-III	INTRODUCTION TO MANAGEMENT	Classes:17

Introduction to Management: Concepts of Management – Nature, Importance – Functions of Management, Levels - Evolution of Management Thought.

Decision Making Process – Methods of Production (Job, Batch and Mass Production) - Inventory Control, Objectives, Functions – Analysis of Inventory – EOQ.

UNIT-IV	PROJECT MANAGEMENT	Classes:15

Project Management: Introduction – Project Life Cycle – Role of Project Manager - Project Selection – Technical Feasibility – Project Financing – Project Control and Scheduling through Networks –(PERT, CPM , CRASHING)– Human Aspects in Project Management.(simple problems)

Text Books

1. Aryasri, Managerial Economics, TMH, 2nd edition, 2005.
2. Varshney & Maheswari, Managerial Economics, Sultan chand, 2003.

Reference Books

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education.
2. Prasanna Chandra, Project planning and Analysis, TATA MC graw hill, New Delhi

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

1. Understand the concepts in economics related to demand and supply.
2. Know about the market structures and production functions.
3. Comprehend various management concepts.
4. Will understand project management concept.
5. Solve simple problems in PERT, CPM and crashing.

TRANSMISSION OF ELECTRIC POWER

B.Tech 5th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1501	Core	3	1	0	3	40	60	100
Contact Classes:55	Tutorial Classes: 10	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. To determine various parameters of transmission line

II. To Model various transmission lines

III. To gain knowledge of UGC and Insulators

IV. To study the concepts of Corona and Sag

UNIT-I	TRANSMISSION LINE PARAMETERS	Classes:17

Transmission Line Parameters: Types of conductors - calculation of resistance for solid conductors -Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition - Problems.

Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Problems.

UNIT-II	PERFORMANCE OF SHORT, MEDIUM&LONG TRANSMISSION LINES	Classes:18

Classification of Transmission Lines : Short, medium and long line and their models - representations - Nominal-T, Nominal-Pie and A, B, C, D Constants, Problems. Mathematical Solutions to estimate regulation and efficiency of all types of lines - Problems.

Performance of Long Transmission Lines: Rigorous method, evaluation of A,B,C,D Constants(convergent series of real and complex angles method), Representation of Long lines –Exact equivalent T and p networks – surge Impedance and surge Impedance loading – Expression for velocity of travelling wave in OHTL&UGC–Ferranti effect, Charging current.

UNIT-III	CORONA& OVERHEAD LINE INSULATORS	Classes:15

Corona: Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

Overhead Line Insulators: Types of Insulators, String efficiency and Methods for improvement, Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

UNIT-IV	SAG AND TENSION CALCULATIONS, UNDERGROUND CABLES	Classes:15

Sag and Tension Calculations: with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Problems.

Underground Cables: Comparison between overhead transmission system and underground cable system, General Construction of cable, Classification of cables, Calculation of Insulation resistance and stress in insulation, Problems. Capacitance of Single and 3-Core cables, Problems. Grading of Cables - Capacitance grading, Problems. Description of Inter-sheath grading, Problems.

Text Books

1. C.L.Wadhwa, “Electrical power systems”, New Age International (P) Limited, Publishers, sixth edition, 2013..
2. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy “A Text Book on Power System Engineering”,Dhanpat Rai & Co Pvt.Ltd. 2009.

Reference Books

1. I.J.Nagarath and D.P.Kothari “Modern Power System Analysis”, Tata McGraw Hill, 2nd Edition.
2. R. K. Rajput, “Power System Engineering”Laxmi Publications, 1st Edition.

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

1. Calculate different types of transmission line parameters
2. Calculate regulation and efficiency for different transmission lines
3. Know the concept of corona and sag in OHTL.
4. Understand different types insulators in OHTL
5. Understand different types of underground cables.

SYNCHRONOUS AND SPECIAL MACHINES

B.Tech 5th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16EE1502	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:55	Tutorial Classes: 10	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

This subject imparts knowledge on construction, operation and applications of synchronous Generators, motors and special machines.

UNIT-I SYNCHRONOUS GENERATORS Classes:20

Synchronous Generators

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, methods of determining regulation – direct load, EMF,MMF, ZPF and ASA, losses and efficiency.

UNIT-II SYNCHRONOUS GENERATORS: Classes:15

Blundell's two reaction method for salient pole machine, Phasor diagram, slip test, regulation of salient pole machines, parallel operation, synchronizing with infinite bus bars, synchronizing current, synchronizing power, expression for power, power angle characteristics, short circuit on 3-phase alternator, effect of variation of excitation and mechanical input on parallel operation, load sharing.

UNIT-III SYNCHRONOUS MOTORS Classes:15

Synchronous Motors

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.

Troubleshooting of motors and generators.

UNIT-IV	SPECIAL MACHINES	Classes:15

Special Machines:

Principle of operation, characteristics and applications of reluctance motor, hysteresis motor, AC series motors and repulsion motors. Stepper motors - Variable reluctance stepper motor,

Construction and operation of BLDC motor- 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

1. Identify the different features of synchronous & special machines
2. Carry out steady state and dynamic analysis of Synchronous machines.
3. Perform and analyze different methods to find regulation of alternators.
4. Plot and interpret the V and inverted V curves and power circles of Synchronous motor.

LINEAR CONTROL SYSTEMS

B.Tech 5th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1503	Core	3	1	0	3	40	60	100
Contact Classes:50	Tutorial Classes: 15	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

I. The lessons in basics of control systems will familiarize with the mathematical frame work of the system modeling and analysis.

II. Introduction to various techniques used in analysis of the dynamical system.

UNIT-I	INTRODUCTION, TRANSFER FUNCTION REPRESENTATION	Classes:15

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

Transfer Function Representation: Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram algebra –Signal flow graph Reduction using Mason's gain formula.

UNIT-II	TIME RESPONSE ANALYSIS & STABILITY ANALYSIS IN S-DOMAIN	Classes:20

Time Response Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors – Effects of proportional derivative, proportional integral systems.

Stability Analysis in S-Domain: The concept of stability-Routh's stability criterion-qualitative stability and conditional stability – limitations of Routh's stability Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT-III	FREQUENCY RESPONSE ANALYSIS& STABILITY ANALYSIS IN FREQUENCY DOMAIN	Classes:15

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin.

Stability Analysis in Frequency Domain: Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots-Stability Analysis.

UNIT-IV	COMPENSATION TECHNIQUES & STATE SPACE ANALYSIS	Classes:15

Compensation Techniques: Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain.

State Space Analysis: Concepts of state, state variables and state model, derivation of state models from differential equations, transfer functions and block diagrams, Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

Text Books

1. I. J. Nagrath and M. Gopal. "Control Systems Engineering", New Age International Limited, Publishers, 2nd edition. 2008
2. B. C. Kuo "Automatic Control Systems", John wiley and son's. 8 thedition 2003

Reference Books

1. Katsuhiko Ogata "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. A. Anand Kumar, "Control Systems" Eastern Economy Edition -PHI learning Private Ltd. 2007

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

1. Provide sound knowledge in the basic concepts of linear control theory and design of control system.
2. Understand the methods of representation of systems and to derive their transfer Functions.
3. Provide adequate knowledge in the time response of systems and steady state error analysis, obtain the open loop and closed loop frequency responses of systems, stability of systems and methods of stability analysis and various methods of designing compensation circuits for a control system.

POWER ELECTRONICS

B.Tech 5th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1504	Core	3	0	0	3	40	60	100
Contact Classes:65	Tutorial Classes: 0	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. To learn different power semiconductor devices.

II. To learn different converter topologies, their operation and applications.

UNIT-I	POWER SEMICONDUCTOR DEVICES DEVICES AND CIRCUITS FOR TRIGGERING AND COMMUTATION	Classes:15

Power Semiconductor Devices: Study of switching devices - SCR, TRIAC, BJT, MOSFET, IGBT and GTO– Static and dynamic characteristics – Turn on and Turn off methods.

Devices and circuits for triggering and commutation: R, RC and UJT Triggering circuits for SCR, line and forced commutation circuits, gate drive circuits for MOSFET&IGBT – Series and parallel operation of SCR,MOSFET&IGBT – Design of Snubber circuit –specifications and ratings of SCR's, BJT and IGBT - Problems.

UNIT-II	SINGLE PHASE CONTROLLED RECTIFIER, THREE PHASE CONTROLLED RECTIFIER	Classes:18

S**Single Phase Controlled Rectifier:** Phase control technique: Half wave, half & full controlled rectifiers –midpoint & bridge connections - Two pulse converter with Resistive, R-L and R-L-E loads – Derivation of average load voltage and current & RMS Value – Active and Reactive power inputs to the converters with and without Freewheeling Diode - Effect of source inductance – Dual converter -problems.

Three Phase Controlled Rectifier: Three pulse and six pulse rectifiers – midpoint & bridge connections – average load voltages with R and RL loads – Effect of Source inductance–Dual converter – Waveforms –Problems.

UNIT-III	AC VOLTAGE CONTROLLERS, CYCLO CONVERTERS	Classes:17

AC Voltage Controllers: Single phase AC Regulators with R and RL loads, modes of operation of TRAIC, AC voltage Regulators Control strategies – Derivation of RMS load voltage, current and power factor, wave forms – problems.

Cycloconverters: Single phase midpoint cycloconverters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cycloconverter (Principle of operation only) – Waveforms.

UNIT-IV	CHOPPERS, INVERTERS	Classes:15

Choppers: Choppers classification and their control strategy – Step down choppers – Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression. Load commutated chopper-DC Jones chopper, problems.

Inverters: Basic series and parallel inverter – Single phase and three phase bridge inverters – voltage source inverters- Current source inverter – Pulse Width Modulation techniques – Introduction to multi level inverters concept – problems.

Text Books

1. M. D. Singh & K. B. Kanchandhani "Power Electronics", Tata Mc Graw Hill Publishing Company,2013.
2. P.S.Bhimbra "Power Electronics", Khanna Publishers, 3rdEdition, 2003.

Reference Books

1. Vedam Subramanyam "Power Electronics", New Age International (P) Limited, 3rd Edition.
2. M. H. Rashid "Power Electronics: Circuits, Devices and Applications", Prentice Hall of India, 2nd Edition, 2004.

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

1. Acquire knowledge about fundamental concepts and techniques used in power electronics.
2. Ability to analyze various single phase and three phase power converter circuits and understand their applications.
3. Foster ability to identify basic requirements for power electronics based design application.
4. Develop skills to build, and troubleshoot power electronics circuits.
5. Foster ability to understand the use of power converters in commercial and industrial applications.

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

B.Tech 5th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1505	Core	3	1	0	3	40	60	100
Contact Classes:55	Tutorial Classes: 10	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. Understand then ecessity and importance of Measurement & Instrumentation.

II. To know about various kinds of measurement techniques, instruments, sensor &transducers.

UNIT-I	MEASURING INSTRUMENTS, INSTRUMENT TRANSFORMERS	Classes:15

Measuring Instruments: Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC , moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunt and series resistance - Types of P.F. Meters – 1-ph and 3-ph meters: dynamometer & moving iron type.

Instrument Transformers: Construction and principle of operation CT and PT – Ratio and phase angle errors.

UNIT-II	MEASUREMENT OF POWER / ENERGY, POTENTIOMETERS	Classes:17

Measurement of Power / Energy: Single phase dynamometer wattmeter, LPF and UPF, expression for deflecting and control torques. Single phase induction type energy meter – driving and braking torques – errors and compensations- Three phase energy meter.

Potentiometers: 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.

UNIT-III	D.C BRIDGES & A.C BRIDGES	Classes:17

D.C Bridges: Method of measuring low, medium and high resistance – sensitivity of Whetstone's bridge – measurement of low resistance: Kelvin's double bridge - measurement of high resistance: loss of charge method

A.C Bridges: Measurement of low & high inductance - Maxwell's, Hays and Anderson's bridge - Measurement of capacitance and loss angle – Desauty, Schering and Wien's bridge.

UNIT-IV	MAGNETIC MEASUREMENTS, DIGITAL METERS, TRANSDUCERS	Classes:16

Magnetic measurements: Determination of B-H loop, method of reversals, measurement of flux.

Digital Meters: Digital Voltmeter-Successive approximation, ramp and integrating type-Digital frequency meter-Digital multimeter-Digital Tachometer:

Transducers: Definition of transducers, Classification of transducers- Principle operation of LVDT transducers- Strain gauge and its principle of operation.

Text Books

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

Reference Books

1. D O Doeblin "Measurements Systems, Applications and Design",Mc Graw Hill Edition.
2. Buckingham and Price "Electrical Measurements ", Prentice Hall of India.

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

1. Understand the various Measuring instruments used to detect various electrical quantities.
2. Gain knowledge about measuring electrical parameters using AC and DC bridges
3. Analyze the various Types of Instrument Transformers.
4. Enhance student knowledge how a Measuring instruments can be designed to reduce the errors and to increase efficiency.
5. Become familiar with Analog and Digital instruments.

AC MACHINES LABORATORY

B.Tech 5th Semester – Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16EE2506	Core	-	-	3	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 39				Total Classes: 39		

OBJECTIVE

The course should enable the students to

Understand the performance of single phase transformer, parallel operation of transformer, performance of induction motor, regulation of alternator and equivalent circuit of single phase induction motor.

LIST OF EXPERIMENTS

Expt. 1 **LOAD TEST ON ALTERNATOR**

To find efficiency of alternator

Expt. 2 **REGULATION OF ALTERNATOR BY SYNCHRONOUS IMPEDANCE & MMF METHODS**

To find regulation of alternator by synchronous impedance and mmf metods

Expt. 3 **REGULATION OF ALTERNATOR BY ZPF METHOD**

To find regulation of alternator by ZPF method

Expt. 4 **MEASUREMENT OF XD AND XQ OF A 3 - PHASE ALTERNATOR**

To measure XD and XQ of a three phase alternator

Expt. 5 **SYNCHRONIZATION OF ALTERNATOR WITH INFINITE BUS**

To perform synchronization of alternator with infinite bus

Expt. 6 **PARALLEL OPERATION OF TWO ALTERNATORS**

To conduct parallel operation of alternators

Expt.7	V AND INVERTED V CURVES OF SYNCHRO NOUS MOTOR

To determine V and inverted V curves of synchronous motor

Expt. 8	SYNCHRONOUS MOTOR PERFORMANCE

I) WITH CONSTANT EXCITATION II) WITH CONSTANT LOAD

To determine the characteristics of synchronous motor

Expt. 9	SEPARATION OF LOSSES IN SINGLE-PHASE TRANSFORMER

To conduct and experiment to separate the losses in a single phase transformer

Expt. 10	SEPARATION OF LOSSES IN 3-PHASE INDUC TION MOTOR

To conduct and experiment to separate the losses in a three phase IM

Expt. 11	LOAD TEST ON INDUCTION GENERATOR

To conduct load test on induction generator

Expt. 12	HARMONICS ANALYSIS OF TRANSFORMER

To analyze harmonics in a single phase transformer

Expt. 13	PARALLEL OPERATION OF TWO-3PHASE TRANSFORMERS

To conduct parallel operation of two three phase transformers

Expt. 14	LOAD TEST ON UNIVERSAL MOTOR

To conduct load test on universal motor

Reference Books

1. P. S. Bhimbra, “Electrical Machinery”, Seventh Edition, 1995,Khanna Publishers.
2. P. K. Mukharjee, S Chakravarti, “Electric Machines”, DhanpatRai& Sons.

To determine the characteristics of synchronous motor

Web References

1. https://www.electrical4u.com
2. https://www.researchgate.net

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:

HARDWARE: Machine Tutor, Desktop Computers (01 nos)

Course Outcome

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

1. Determine regulation of an alternator by conducting direct load test, Synchronous impedance, MMF and ZPF methods
2. Measure Xd and Xq of a 3 - phase alternator
3. Perform load test on induction generators
4. Plot V and inverted V curves of synchronous motor
5. Synchronize an alternator with an infinite bus
6. Separate core losses in a single phase transformer

CONTROL SYSTEMS LABORATORY

B.Tech 5th Semester – Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16EE2507	Core	-	-	3	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 39				Total Classes: 39		

OBJECTIVE

The course should enable the students to

I. The objective of this laboratory is to enable the students to strengthen their understanding of the design and analysis of control systems through practical exercises.

II. This will be accomplished by using modern software resources to analyze and simulate the performance of realistic system models and to design control systems to satisfy various performance specifications.

III. Students will learn how to implement various types of compensators and control algorithms using MATLAB and Simulink.

LIST OF EXPERIMENTS

Expt. 1 **TIME RESPONSE OF SECOND ORDER SYSTEM**

To determine characteristics of time response of Second order system

Expt. 2 **CHARACTERISTICS OF SYNCHROS**

To determine characteristics Characteristics of Synchros

Expt. 3 **PROGRAMMABLE LOGIC CONTROLLER – STUDY AND VERIFICATION OF TRUTH TABLES OF LOGIC GATES, SIMPLE BOOLEAN EXPRESSIONS.**

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

Expt. 4 **EFFECT OF FEEDBACK ON DC SERVO MOTOR**

To study effect of feedback on DC servo motor

Expt. 5 **CHARACTERISTICS OF AC SERVO MOTOR**

To determine Characteristics of AC servo motor

Expt. 6	**EFFECT OF P, PD, PI, PID CONTROLLER ON A SECOND ORDER SYSTEMS**

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

Expt.7	**LAG AND LEAD COMPENSATION – MAGNI TUDE AND PHASE PLOT**

To study Lag and lead compensation – Magnitude and phase plot

Expt. 8	**TRANSFER FUNCTION OF DC GENERATOR**

To determine Transfer function of DC generator

Expt. 9	**TEMPERATURE CONTROLLER USING PID**

To study temperature controller using PID

Expt. 10	**CHARACTERISTICS OF MAGNETIC AMPLIFIERS**

To determine Characteristics of magnetic amplifiers

Expt. 11	**CONTROLLABILITY AND OBSERVABILITY OF THE SYSTEM USING MATLAB**

To study Controllability and Observability of the system using MATLAB

Expt. 12	**LINEAR SYSTEM ANALYSIS (TIME DOMAIN ANALYSIS, ERROR ANALYSIS) USING MATLAB**

To perform Linear system analysis (Time domain analysis, Error analysis) using MATLAB

Expt. 13	**STABILITY ANALYSIS (BODE, ROOT LOCUS, NYQUIST) OF LINEAR TIME INVARIANT SYS TEM USING MATLAB**

To perform Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB

Expt. 14	**STATE SPACE MODEL FOR CLASSICAL TRANS FER FUNCTION USING MATLAB – VERIFICA TION.**

To study State space model for classical transfer function using MATLAB – Verification

Expt. 15	**EFFECT OF ADDING POLES AND ZEROES TO A SYSTEM- MATLAB VERIFICATION.**

To study Effect of adding poles and zeroes to a system- MATLAB Verification

Expt. 16	DESIGN A LEAD/LAG OR LEAD-LAG COM PENSATOR - MATLAB VERIFICATION.

To Design a lead/lag or lead-lag compensator - MATLAB Verification

Expt. 17	CHARACTERISTICS OF OP-AMP BASED INTE GRATOR AND DIFFERENTIATOR USING PSPICE.

To study Characteristics of OP-AMP based integrator and differentiator using PSPICE

Reference Books

1. M.H.Rashid “Simulation of Electrical and electronics Circuits using PSPICE”, M/s PHI Publications.
2. PSPICE A/D user’s manual – Microsim, USA

Web References

1. https://www.electrical4u.com
2. https://www.researchgate.net

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE:MATLAB R2017a

HARDWARE: Desktop Computers (03 nos)

Course Outcome

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

1. obtain transfer functions of LTI systems and servomotors
2. Analyze LTI systems through hardware.
3. Write MATLAB programming for the analysis of LTI system.
4. Find the stability of the system through MATLAB programming.
5. Write PSPICS code for the analysis different systems.
6. design controllers, compensators using MATLAB software

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LABORATORY

B.Tech 5th Semester – Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
16EE2508	Core	L	T	P	C	CIA	SEE	Total
		-	-	3	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 39				Total Classes: 39		

OBJECTIVE

The course should enable the students to

I. To understand the correct function of electrical parameters and calibration of voltage, current, single phase and three phase power and energy, and measurement of electrical characteristics of resistance, inductance and capacitance of a circuits through appropriate methods.

II. To understand testing of transformer oil.

LIST OF EXPERIMENTS

Expt. 1 **CALIBRATION AND TESTING OF SINGLE PHASE ENERGY METER**

To Calibrate and Test a single phase energy Meter

Expt. 2 **CALIBRATION OF DYNAMOMETER POWER FACTOR METER**

To Calibration of dynamometer power factor meter

Expt. 3 **CROMPTON D.C. POTENTIOMETER – CALI BRATION OF PMMC AMMETER AND PMMC VOLTMETER**

To Study Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.

Expt. 4 **KELVIN'S DOUBLE BRIDGE – MEASUREMENT OF RESISTANCE – DETERMINATION OF TOL ERANCE.**

To study Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.

Expt. 5	**MEASUREMENT OF % RATIO ERROR AND PHASE ANGLE OF GIVEN C.T. BY COMPARISON.**
To Measure % ratio error and phase angle of given C.T. by comparison.	
Expt. 6	**MEASUREMENT OF CAPACITANCE USING SCHERING BRIDGE & ANDERSON BRIDGE.**
To Measure capacitance using Schering Bridge & Anderson Bridge	
Expt.7	**MEASUREMENTS OF 3 PHASE REACTIVE POWER WITH SINGLE-PHASE WATTMETER.**
To Measure 3 phase reactive power with single-phase wattmeter	
Expt. 8	**MEASUREMENT OF PARAMETERS OF A CHOKE COIL USING 3 VOLTMETER AND 3 AM METER METHODS. LAMPS**
To Measure of parameters of a choke coil using 3 voltmeter and 3 ammeter methods. lamps	
Expt. 9	**CALIBRATION LPF WATTMETER – BY PHAN TOM TESTING**
To Calibrate LPF wattmeter – by Phantom testing	
Expt. 10	**MEASUREMENTS OF 3 PHASE POWER WITH TWO WATT METER METHOD (BALANCED & UNBALANCED).**
To Measure 3 phase power with Two watt meter method (Balanced & Unbalanced).	
Expt. 11	**LVDT AND CAPACITANCE PICKUP – CHARAC TERISTICS AND CALIBRATION**
To study LVDT and capacitance pickup – characteristics and Calibration	
Expt. 12	**RESISTANCE STRAIN GAUGE – STRAIN MEA SUREMENTS AND CALIBRATION**
To perform Resistance strain gauge – strain measurements and Calibration	
Expt. 13	**TRANSFORMER TURNS RATIO MEASURE MENT USING AC BRIDGE**
To determine Transformer turns ratio measurement using AC Bridge	
Expt. 14	**A.C. POTENTIOMETER – CALIBRATION OF AC VOLTMETER, PARAMETERS OF CHOKE..**
To study A.C. Potentiometer – Calibration of AC Voltmeter, Parameters of Choke..	

Expt. 15	MEASUREMENT OF INDUCTANCE BY MAXWELL'S BRIDGE AND MEASUREMENT OF CAPACITANCE BY WIEN'S BRIDGE

To Measure inductance by Maxwell's bridge and measurement of capacitance by Wien's bridge

Expt. 16	B-H LOOP CHARACTERIZATION OF A GIVEN MAGNETIC MATERIAL.

To determine B-H loop characterization of a given magnetic material.

Reference Books

1. M.H.Rashid "Simulation of Electrical and electronics Circuits using PSPICE", M/s PHI Publications.
2. PSPICE A/D user's manual – Microsim, USA

Web References

1. https://www.electrical4u.com
2. https://www.researchgate.net

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

HARDWARE: -

Course Outcome

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

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 CRO to analyze different waveforms
5. Test transformer oil.

TERM PAPER

B.Tech 5th Semester: Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16AS3501	-	-	-	-	2	0	50	50
Contact Classes: 24	Tutorial Classes: Nil		Practical Classes: Nil			Total Classes: 24		

OBJECTIVES

The course should enable the students to:

I. Guide students through the process of planning and executing a substantial project.

II. Allow students the opportunity to teach themselves.

III. Improves the power of designing, organizing, communication, coordination and judgment.

The Term Paper is a self study report and shall be carried out either during 5th 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 5th 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.

Outcomes

1. Prepare comprehensive report based on literature survey related to considered area
2. Select the paper to be solved and analyze the extension possibilities
3. Identify the applicability of modern software tools and technology
4. Correct himself to improve write-up skills
5. Exhibit the professional behavior

QUANTITATIVE APTITUDE

B.Tech 5th Semester: Electrical & Electronics Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16AS3502	-	-	-	-	1	0	50	50
Contact Classes: 12	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 12**		

The external examination will be conducted for 50 Marks with 1 Credit; examination type is Multiple Choice Question (MCQ) – Offline/Online.

OBJECTIVES

The course should enable the students to :

1. Formulate the problem quantitatively and use appropriate arithmeti cal methods to solve the problem.
2. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
3. Solve campus placements aptitude papers covering Quantitative Ability
4. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

UNIT-I	**Classes:3**
Calendars, Clocks, L. C. M & H. C. F, Problems on Numbers, Averages.	
UNIT-II	**Classes:3**
Percentages, Profit, Loss & Discount, Simple Interest & Compound Interest.	
UNIT-III	**Classes:3**
Ratio & Proportion, Mixture and Alligation, Partnership, problems on ages.	
UNIT-IV	**Classes:3**
Time & Work, Pipes and Cisterns, Time & Distance, Problem on Trains, Boats and Streams, Mensuration.	

Text Books

1. Dr. R.S. Aggarwal, "Quantitative Aptitude", S.Chand Publication, New Delhi.

Reference Books

1. Quantitative Aptitude - G. L BARRONS
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", 4th Edition.

Web References

1. www.indiabix.com
2. https://www.campusgate.co.in
3. https://m4maths.com

PROFESSIONAL ACTIVITIES-III

B.Tech 5th Semester: Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16AS3503	-	-	-	-	1	-	-	-
Contact Classes: 12	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 12			

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:

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

MICROPROCESSORS AND MICROCONTROLLERS

B.Tech 6th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EC1604	Core	3	1	0	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

I. The objective of this course is to become familiar with the architecture and the instruction set of an Intel microprocessor
II. Assembly language programming will be studied as well as the design of various types of digital and analog interfaces
III. Understand the architecture of 8085 and 8051

UNIT-I	INTRODUCTION, ASSEMBLY LANGUAGE PROGRAMMING	Classes:16

Introduction: Introduction to 8085, Architecture of 8086 microprocessor, special functions of general purpose registers.8086 flag register and function of 8086 flags, addressing modes of 8086,instruction set of 8086.assembler directives, simple programs, procedures and macros.

Assembly Language Programming: Assembly language programs involving logical, branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation.

UNIT-II	DETAILS OF 8086 & INTERFACING, PROGRAMMABLE INTERFACING DEVICES	Classes:18

Details of 8086 & Interfacing: Pin diagram of 8086-Minimum mode and maximum mode of operation, Timing diagram, memory interfacing to 8086(static RAM and EPROM). Need for DMA. DMA data transfer method. Interfacing with 8237/8257.

Programmable Interfacing Devices: 8255 PPI-various modes of operation and interfacing to 8086.interfacing keyboard, displays, 8279 stepper motor and actuators. D/A and A/D converter interfacing, Interrupt structure of 8086, Vector interrupt table. Interrupt service routines.

UNIT-III	SERIAL DATA TRANSFER SCHEMES, PROGRAMMABLE INTERRUPT CONTROLLERS	Classes:15

Serial Data Transfer Schemes: Asynchronous and synchronous data transfer schemes.8251 USART architecture and interfacing.TTL to RS232C and RS232C to TTL conversion. Sample program of serial data transfer. Introduction to high-speed serial communications standards, USB.
Programmable Interrupt Controllers: 8259 PIC architecture and interfacing cascading of interrupt controller and its importance, Programming with 8259, Programmable interval timer 8253, Modes of 8253, Programming examples with 8253.

UNIT-IV	8051 MICROCONTROLLER AND ITS PROGRAMMING, ADVANCED MICROCONTROLLERS	Classes:16

8051 Microcontroller and Its Programming: Architecture of micro controller-8051 Microcontroller- internal and external memories-counters and timers-synchronous serial-cum asynchronous serial communication-interrupts. Addressing modes of 8051, Instructor set of 8051, Assembly Language/C Programming examples using 8051.
Advanced Microcontrollers: ARM Microcontrollers: ARM Core Architecture, Versions of ARM, Important Features. Programming examples of ARM using IDE.

Text Books

1. Advanced microprocessor and peripherals-A.K. Ray and K.M.Bhurchandi, 2nd edition, TMH, 2000.
2. Microcontrollers-Deshmukh, Tata Mc-Graw Hill Edition, 2004.

Reference Books

1. Microprocessors Interfacing-Douglas V.Hall, 2nd edition, 2007.
2. The 8088 and 8086 Microprocessors- Walter A. Triebel, Avtar Singh, PHI, 4th Edition, 2003.

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

1. learn the basic microprocessor architecture and to gain knowledge on interfacing components with processors and micro controllers
2. learn the fundamentals architectures of 8255, 8259, 8086 programming in assembly language, Software Design Kit (SDK), System integration with 8086
3. learn different Communication protocols like RS232, SPI, and I2C

LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

B.Tech 6th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EC1610	Core	3	1	0	3	40	60	100
Contact Classes:55	Tutorial Classes: 10		Practical Classes: Nil			Total Classes:65		

OBJECTIVES

I. The objective of this course is to become familiar with the architecture and the instruction set of an Intel microprocessor

II. Assembly language programming will be studied as well as the design of various types of digital and analog interfaces

III. Understand the architecture of 8085 and 8051

UNIT-I	INTEGRATED CIRCUITS	Classes:20

Integrated Circuits: Differential amplifier –DC and AC analysis of Dual input balanced output configuration, Properties of other differential amplifier configuration (dual input unbalanced output, single ended input-balanced/unbalanced output), DC coupling and cascade differential amplifier stages, Level Translator.

Characteristics of OP-Amps, integrated circuits-types, classification, package types and temperature ranges, power supplies, OP-Amp Block diagram, ideal and practical OP-Amp specifications, DC and AC characteristics, 741 OP-Amp and its features, FET input OP-Amps, OP-Amp parameters and measurement, input and output offset voltages and currents, slew rate, CMRR, PSRR, drift, Frequency compensation technique.

UNIT-II	LINEAR& NON LINEAR APPLICATIONS OF OP-AMPS	Classes:15

Linear Applications of OP-AMPS: Inverting and non-inverting amplifier, integrator and differentiator, difference amplifier, instrumentation amplifier, AC amplifier, V-I, I-V converters, Buffers.

Non Linear Applications of OP-AMPS: Non-linear function generation, comparators, Multivibrators, Triangular and square wave generators, Log and antilog amplifiers, precision rectifiers.

UNIT-III	ANALOG FILTERS, TIMERS AND PHASE LOCKED LOOPS	Classes:15

Analog Filters: Introduction, Butterworth filters-first order, second order LPF, HPF filters. Band pass, Band reject and all pass filters.

Timers and Phase Locked Loops: Introduction to 555 Timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, PLL-Introduction, Block schematic, principles and description of individual blocks,565 PLL ,applications of PLL-Frequency multiplication, frequency translation, AM, FM and FSK demodulators.

UNIT-IV	D/A AND A/D CONVERTERS, ANALOG MULTIPLIERS AND MODULATORS	Classes:15

D/AAND A/D Converters: Introduction, Basic DAC techniques, weighted resistor DAC, R-2R Ladder DAC, Inverted R-2R DAC and IC 1408 DAC, different types of ADCs-parallel comparator type ADC, counter type ADC, successive approximation ADC and Dual slope ADC.DAC and ADC specifications, specifications AD 574 (12 bit ADC).

Analog Multipliers and Modulators: Four quadrant multiplier, Balanced modulator, IC 1496, applications of analog switches and multiplexers, sample and hold amplifiers, Voltage regulator (IC based).

Text Books

1. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, 4th edition, PHI, 2000.
2. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, 6th edition, PHI, 2000.

Reference Books

1. Operational Amplifiers & Linear ICs by David A. Bell, 2nd edition, Oxford University Press, 2010.
2. Linear Integrated Circuits – D. Roy Chowdhary, New Age International (p) Ltd, 2nd Edition, 2003.

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

1. Introduce the basic building blocks of linear integrated circuits.
2. Teach the linear and non-linear applications of operational amplifiers.
3. Introduce the theory and applications of analog multipliers and PLL.
4. Teach the theory of ADC and DAC
5. Introduce a few special function integrated circuits

SWITCHGEAR AND PROTECTION

B.Tech 6th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1601	Core	3	1	0	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

I. To understand the need of protection of electric equipment and their protection schemes

II. To understand operations & characteristics of various electromagnetic and static relays

III. To understand the operations of various types of circuit breakers and their ratings

IV. To understand the unit protection and over voltage protection of different apparatus in power system

UNIT-I	CIRCUIT BREAKERS-I&II	Classes:15

Circuit Breakers-I: Circuit Breakers: Elementary principles of arc interruption, Restriking Voltage and Recovery voltages, Restriking Phenomenon, Average and Max. RRRV, Problems, Current Chopping and Resistance Switching, CB ratings and Specifications, Types and Problems.

Circuit Breakers-II: Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT-II	PROTECTIVE RELAYS, STATIC AND MICROPROCESSOR BASED RELAYS	Classes:20

Protective Relays: Basic Requirements of Relays, types of relays, Construction details of Attracted armature, balanced beam, induction type and differential relays, Universal Torque equation, characteristics of over current, Direction and distance relays.

Static and Microprocessor Based Relays: block diagram Static Relays, Advantages and Disadvantages, Definite time, Inverse and IDMT static relays, Comparators, Amplitude and Phase comparators. Microprocessor based relays, Advantages and Disadvantages, Block diagram for over current (Definite, Inverse and IDMT) and Distance Relays and their Flow Charts.

UNIT-III	GENERATOR& TRANSFORMER PROTECTION	Classes:15

Generator Protection: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Problems on % Winding Unprotected.

Transformer Protection: Protection of transformers, Percentage Differential Protection, Problem on Design of CT s Ratio, Buchholtz relay Protection.

UNIT-IV	PROTECTION OF FEEDERS, TRANSMISSION LINES AND BUS BARS, PROTECTION AGAINST OVER VOLTAGES	Classes:15

Protection of Feeders, Transmission Lines and bus bars: Protection of Radial & Ring main Feeders using over current Relays. Protection of Transmission line, 3 Zone protection using Distance Relays, Carrier current protection, Protection of Bus bars.

Protection against Over Voltages: Generation of Over Voltages in Power Systems-Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL.

Text Books

1. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, 4th edition, PHI, 2000.
2. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, 6th edition, PHI, 2000.

Reference Books

1. Operational Amplifiers & Linear ICs by David A. Bell, 2nd edition, Oxford University Press, 2010.
2. Linear Integrated Circuits – D. Roy Chowdhary, New Age International (p) Ltd, 2nd Edition, 2003.

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

1. Explain the concepts and working of different types of switchgear like circuit breakers, relays etc
2. Elucidate various protection schemes of power system components like alternators, transformers and bus-bars.
3. Expound the concepts of over voltage protection

POWER SEMICONDUCTOR DRIVES

B.Tech 5th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1602	Core	3	0	0	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. To learn the basics of power semiconductor switches

II. To understand the working of various types of converters and application of them.

III. To understand and design the drive circuits for various Power Semiconductor Switches.

IV. To learn to model the converters and semiconductor switches.

V. To learn about the control of various power semiconductor switches.

UNIT-I	INTRODUCTION TO ELECTRIC DRIVES, CONVERTER FED DC DRIVES	Classes:15

Introduction to Electric Drives: Electric drive- definition- advantages of electric drives-dynamics control of electric drives-closed loop control.

Converter Fed DC Drives: 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.

UNIT-II	FOUR QUADRANT OPERATION OF DC DRIVES, CONTROL OF DC MOTORS BY CHOPPERS	Classes:20

Four Quadrant Operation of DC Drives: Introduction to Four quadrant operation, Motoring and Braking operations, Electric Braking: Plugging, Dynamic and Regenerative Braking operations. Four quadrant operation of DC motors by dual converters, closed loop operation of DC motor.

Control of DC Motors by Choppers: Single quadrant, Two –quadrant and four quadrant chopper fed DC separately excited and series motors: Continuous current operation, Output voltage and current wave forms, Speed torque expressions, speed torque characteristics, Problems on Chopper fed DC Motors, Closed Loop operation of chopper fed drives.

UNIT-III	VOLTAGE CONTROL OF INDUCTION MOTORS, FREQUENCY CONTROL OF INDUCTION MOTORS	Classes:15

Voltage Control of Induction Motors: Variable voltage characteristics of induction motors, Control of Induction Motor by AC Voltage Controllers, speed torque characteristics.

Frequency Control of Induction Motors: Variable frequency characteristics, Variable frequency control of induction motor by Voltage source and current source inverter and cycloconverters, PWM control , Comparison of VSI and CSI operations , Speed torque characteristics. Closed loop operation of induction motor drives

UNIT-IV	ROTOR SIDE CONTROL OF INDUCTION MOTOR, CONTROL OF SYNCHRONOUS MOTORS	Classes:15

Rotor Side Control of Induction Motor: static rotor resistance control, Slip power recovery, Static Scherbius drive, Static Kramer Drive , their performance and speed torque characteristics ,advantages , applications , problems.

Control of Synchronous Motors: Separate control & self control of synchronous motors, Operation of self controlled synchronous motors by VSI, CSI and cycloconverters. 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. G K Dubey “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
5. https://www.iare.ac.in

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 d.c motor drive
5. Select the drives for any particular application

UTILIZATION OF ELECTRICAL ENERGY

B.Tech 6th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1603	Core	3	0	0	3	40	60	100
Contact Classes:65	Tutorial Classes: 0	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

This subject gives a comprehensive idea in utilization of electrical power such as drives, electric heating, electric welding and illumination, electric traction, electrolysis, refrigeration air conditioning and automobile electric system.

UNIT-I	MOTOR POWER RATING AND SELECTION	Classes:16

Motor Power Rating and Selection: General considerations in selecting motor power ratings, Selection of motor capacity for continuous duty. Equivalent current, torque and power methods, Selection of capacity for short time and intermittent periodic duty. Heating and cooling of motors. Load equalization, fly wheel and its applications in load equalization.

UNIT-II	ELECTRIC TRACTION	Classes:16

Electric Traction: Systems of electric traction - transmission of drive - mechanics of train movement, speed-time curves, effect of speed, acceleration and distance on schedule, Power and energy output from driving axles, specific energy output, series – parallel method of speed control, shunt bridge transition, collectors, different types of electric braking, reverse current, rheostat and regenerative braking. Counter current braking and reversal of shunt motors.

UNIT-III	ELECTRIC HEATING, WELDING	Classes:18

Electric Heating: 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

Welding: Types of welding, resistance and arc welding, characteristics of Carbon and metallic arc welding, comparison (Excluding electronic controls).

UNIT-IV	ILLUMINATION	Classes:15

Illumination: 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.

Text Books

1. Utilization Electric Power by Openshaw Taylor, Macmillan publisher
2. Utilization of Electrical Power by J.B.Gupta, Kataria publisher

Reference Books

1. Fundamentals of Electrical Drives by Gopal.K.Dubey,Narosa publishing house
2. Utilization of Electrical Energy by H.Partab

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

1. Demonstrate the concepts of electric heating & welding
2. Demonstrate the different types of lights and design lighting schemes according to the given specification
3. Demonstrate the concepts of electric traction & braking methods.
4. Select motor ratings for various applications

HIGH VOLTAGE ENGINEERING (Elective – I)

B.Tech 6th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1604	Core	3	1	0	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. To understand the principles of theory of high voltage generation and measurements.

II. To understand the operation of high voltage power supplies for ac, dc, and impulse voltages

III. To get familiar with various applications where high voltage field is used.

IV. To understand breakdown 0f HV insulation (solid, Liquid and Gas).

V. To understand lightning phenomena and HV Insulation Environmental pollution.

UNIT-I	OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS	Classes:15

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages – Reflection and Refraction of Travelling waves- Protection against over voltages.

UNIT-II	DIELECTRIC BREAKDOWN DIELECTRIC BREAKDOWN	Classes:16

Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of oil quality – Breakdown mechanisms in solid and composite dielectrics.

UNIT-III	GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS	Classes:17

Generation of High DC, AC, impulse voltages and currents - Triggering and control of impulse generators.

Measurement of High Voltages and High Currents:

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters – Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

UNIT-IV	HIGH VOLTAGE TESTING & INSULATION COORDINATION HIGH VOLTAGE TESTING & INSULATION COORDINATION	Classes:17

High voltage testing of electrical power apparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination.

Text Books

1. Computer Methods in Power Systems, Stagg Ei–Abiad & Stags, Mc Graw–Hill Edition.
2. Modern Power System Analysis – by I.J.Nagarath & D.P.Kothari: Tata Mc Graw Hill Publishing Company, 2nd Edition.

Reference Books

1. Electrical Power System Analysis by Dr.S.Siva Nagaraju and B. Rami Reddy, published by University Science Press.
2. Power System Analysis by Grainger and Stevenson, Tata Mc Graw Hill.

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

1. Understand concepts of breakdown phenomena of solid, liquid and gases along with causes of overvoltage and protection from them.
2. List of various methods of generation and measurement of DC, AC and Impulse high voltages.
3. Acquire knowledge of various DC, AC and impulse testing of high voltage equipment and materials.
4. Understand safety measures, earthing, shielding for layout of HV apparatus required in high voltage laboratory.

SIGNALS AND SYSTEMS (Elective – I)

B.Tech 6th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EC1303	Core	3	1	0	3	40	60	100
Contact Classes:55	Tutorial Classes: 10		Practical Classes: Nil			Total Classes:65		

OBJECTIVES

I. To explain signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms

II. To understand Sampling theorem, with time and frequency domain analysis of discrete time signals with DTFS, DTFT and Z-Transform

III. To present the concepts of convolution and correlation integrals and also understand the properties in the context of signals/systems and lay down the foundation for advanced courses.

UNIT-I	INTRODUCTION TO SIGNALS, FOURIER SERIES	Classes :15

Introduction to Signals, Fourier Series:Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Representation of function by a set of mutually orthogonal functions. Classification of signals, elementary signals, basic operations on signals, classification of systems, basic system properties

Fourier series representation of Continuous-time periodic signals, Convergence of the Fourier Series, Properties of Continuous time Fourier Series, the complex Fourier spectrum

UNIT-II	FOURIER REPRESENTATION OF PERIODIC SIGNALS AND ANALYSIS OF LIT SYSTEMS	Classes :15

Fourier Representation of Aperiodic Signals: The Continuous-time

Fourier Transform, Fourier transforms of standard signals, Fourier transform for periodic signals, Properties of the continuous time Fourier transform.

Linear time invariant systems: impulse response, input-output relation for a linear system, transfer function of an LTI system, filter characteristics of a linear system, distortion less transmission through a system, signal and system bandwidth, ideal filter characteristics, causality and Paley-Wiener criterion for physical realization

UNIT-III	SAMPLING OF CONTINOUS TIME SIGNALS	Classes:15

Sampling theorem for band-limited signals: types of sampling, effect of under sampling- Aliasing. Correlation: Convolution and Correlation, graphical analysis of convolution, 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.

UNIT-IV	LAPLACE TRANSFORMS AND Z-TRANSFORMS	Classes:15

Laplace transforms: Review of Laplace transforms, Properties of L.T's, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Relation between L.T's, and F.T. of a signal.

Z–Transforms: Introduction, The Z-transform, The region of convergence for the Z-transform, The Inverse Z-transform: Properties of Z-transform, Analysis and characterization of LTI systems using Z- transforms

Text Books

1. B.P. Lathi, Signals, Systems & Communications, BS Publications, 1 edition 2008..
2. .V. Oppenheim, A.S. Willsky and S.H. Nawab , Signals and Systems, PHI, 2nd Edition, 2009.

Reference Books

1. Simon Haykin and Van Veen ,Signals & Systems, Wiley, 2nd Edition, 2007.
2. Michel J. Robert , Fundamentals of Signals and Systems, MGH International Edition, 2008.

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

1. Differentiate between continuous and discrete time signals
2. Know Fourier representation of signals
3. Emphasize on Fourier spectrum of signal
4. Know the Ideal characteristics of filters and Concept of region of convergence(ROC)
5. Know the Significance of Sampling

DATABASE MANAGEMENT SYSTEMS (Elective – I)

B.Tech 6th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16CS1401	Core	3	1	0	3	40	60	100
Contact Classes:55	Tutorial Classes: 10	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

UNIT- I	DATA BASE SYSTEM APPLICATIONS	Classes:16

Data base System Applications, File Systems vs. DBMS, View of Data, Data Abstraction, Instances and Schemas, Data Models, Database Languages, Data base Architecture.

Structured Query Language (SQL): The Form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Functions, Conversion functions, String Functions, Math functions, Date functions, Null Values, Logical Connectivity's-AND, OR and NOT, Joins, Views, Triggers and Active Data Bases.

UNIT-II	THE RELATIONAL MODEL	Classes:17

The Entity Relationship Model: Database Design and ER diagrams, Entities, Attributes, and Entity sets, Relationships and Relationships Sets, Additional Features of the ER Model, Conceptual Design with the ER Model, Conceptual Design for Large Enterprises.

The Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data. Logical Database Design: ER Model to Relational Model, Views.

UNIT-III	SCHEMA REFINEMENT AND NORMAL FORMS	Classes:17

Schema refinement and Normal forms: Schema refinement, Problems Caused by redundancy, Decompositions, Problem related to decomposition, Functional Dependencies, Reasoning about FDS, Normal Forms, Properties of Decomposition, Normalization, Schema Refinement in Database Design, Other kinds of Dependencies.

Storage and indexing: The Memory Hierarchy, RAID, Disk Space Management, Buffer Management, Files of Records, Page Formats, Record formats. Index Data Structures, Hash Based indexing, Tree based Indexing.

UNIT-IV	TRANSACTIONS, CONCURRENCY CONTROL	Classes:17

Transactions: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability - Recoverability – Implementation of Isolation, Testing for serializability.

Concurrency control: Lock –Based Protocols, Timestamp Based Protocols- Validation- Based Protocols, and Multiple Granularity.

Text Books

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems, III Edition, TATA McGrawHill.
2. Silberschatz, Korth, Sudarshan Data base System Concepts, V Edition, McGraw hill.

Reference Books

1. RamezElmasri, ShamkantB.Navrate Fundamentals of Database Systems, 5th Edition Pearson.
2. C.J.Date , Introduction to Database Systems, Pearson Education.

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

1. Identify and define the data models needed to design a database.
2. Understand normalization process on existing database for eliminating redundancy.
3. Apply the recovery techniques for managing the database effectively to avoid data lose.
4. Apply Integrity constrains over the relations.

AVAILABLE SELECTED MOOCs (ELECTIVE-I)

B.Tech 6th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16EE1605	Elective	L	T	P	C	CIA	SEE	TOTAL
		3	-	-	3	40	60	100
Contact Classes: -	Tutorial Classes: -	Practical Classes: Nil			Total Classes: -			

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

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.

MICROPROCESSORS AND MICROCONTROLLERS LABORTORY

B.Tech 6th Semester – Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16EC2613	Core	-	-	3	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 39				Total Classes: 39		

OBJECTIVES

The course should enable the students to

I. Study the Architecture of 8085 & 8086 microprocessor.

II. Learn the design aspects of I/O and Memory Interfacing circuits.

III. Study the Architecture of 8051 microcontroller

LIST OF EXPERIMENTS

Expt. 1 **ARITHMETIC OPERATION – MULTI BYTE ADDITION AND SUBTRACTION, MULTIPLICATION AND DIVISION – SIGNED AND UNSIGNED ARITHMETIC OPERATION. ASCII – ARITHMETIC OPERATION- MULTI BYTE ADDITION AND SUBTRACTION, MULTIPLICATION AND DIVISION**

To study Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation. ASCII – arithmetic operation- Multi byte Addition and Subtraction, Multiplication and Division

Expt. 2 **LOGIC OPERATIONS – SHIFT AND ROTATE – CONVERTING PACKED BCD TO UNPACKED BCD, BCD TO ASCII CONVERSION.**

To study Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.

Expt. 3	**BY USING STRING OPERATION AND INSTRUC TION PREFIX: MOVE BLOCK, REVERSE STRING, SORTING, INSERTING, DELETING, LENGTH OF THE STRING, STRING COMPARI SON.**

To Study Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.

Expt. 4	**A) GENERATING THE FIBONACCI SERIES.** **B) ASCENDING ORDER OF N-8BIT NUMBERS.** **C) DESCENDING ORDER OF N-8BIT NUMBERS.**

To study Generating the Fibonacci series, Ascending order of N-8bit numbers,

Descending order of N-8bit numbers.

Expt. 5	**INTERFACING STEPPER MOTOR WITH 8086 MICROPROCESSOR** **A) CLOCKWISE 5 ROTATIONS** **B) ANTI CLOCKWISE 5 ROTATIONS**

To study Interfacing stepper motor with 8086 microprocessor

a) Clockwise 5 rotations

b) Anti clockwise 5 rotations

Expt. 6	**INTERFACING DAC WITH 8086 MICROPRO CESSOR** **A) GENERATING TRIANGULAR WAVEFORM** **B) GENERATING SAW TOOTH WAVEFORM** **C) GENERATING SQUARE WAVEFORM**

To study Interfacing DAC with 8086 microprocessor

Expt.7	**VERIFICATION OF THE GIVEN STRING IS WHETHER PALINDROME OR NOT.**

To study Verification of the given string is whether palindrome or not.

Expt. 8	**READING AND WRITING ON A PARALLEL PORT.**
To study Reading and Writing on a parallel port	
Expt. 9	**TIMER IN DIFFERENT MODES.**
To study Timer in different modes.	
Expt. 10	**SERIAL COMMUNICATION IMPLEMENTA TION.**
. To study Serial communication implementation.	
Expt. 11	**8259 – INTERRUPT CONTROLLER: GENERATE AN INTERRUPT USING 8259 TIMER.**
To study 8259 – Interrupt Controller: Generate an interrupt using 8259 timer	
Expt. 12	**8279 – KEYBOARD DISPLAY: WRITE A SMALL PROGRAM TO DISPLAY A STRING OF CHAR ACTERS.**
To study 8279 – Keyboard Display: Write a small program to display a string of characters.	
Expt. 13	**8255 – PPI: WRITE ALP TO GENERATE SINU SOIDAL WAVE USING PPI.**
To study 8255 – PPI: Write ALP to generate sinusoidal wave using PPI.	
Expt. 14	**8251 – USART: WRITE A PROGRAM IN ALP TO ESTABLISH COMMUNICATION BETWEEN TWO PROCESSORS.**
To study 8251 – USART: Write a program in ALP to establish Communication between two processors.	

Reference Books

1. Advanced Microprocessors and Peripherals, A.K. Ray and K.M. Bhurchandi , TMH
2. Microprocessors and Interfacing, Douglas V. Hall , II Edn ,TMH

Web References

1. https://www.electrical4u.com
2. https://www.researchgate.net

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS

SOFTWARE: Microprocessor and microcontroller kits

HARDWARE: Desktop Computers (05 nos)

Course Outcome

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

1. execute different arithmetic and logical operations using 8086 Micro processor
2. interface stepper motor and DAC to 8086 micro processor
3. interface the microcontroller 8051 with PPI, Keyboard

POWER ELECTRONICS LABORATORY

B.Tech 6th Semester – Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16EE2606	Core	-	-	3	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil		Practical Classes: 39			Total Classes: 39		

OBJECTIVES

The course should enable the students to

I. To expose students to operation and characteristics of power semicon ductor devices and passive components, their practical application in power electronics.

II. To provide a practical exposure to operating principles, design and syn thesis of different power electronic converters.

III. To introduce students to industrial control of power electronic circuits as well as safe electrical connection and measurement practices

LIST OF EXPERIMENTS

Expt. 1	**STATIC CHARACTERISTICS OF SCR**

To study Static characteristics of SCR

Expt. 2	**STATIC CHARACTERISTICS OF MOSFET & IGBT.**

To study Static Characteristics of MOSFET & IGBT.

Expt. 3	**GATE TRIGGERING METHODS FOR SCRS' (R, R-C)**

To Study Gate triggering methods for SCRs' (R, R-C)

Expt. 4	**SINGLE PHASE FULLY CONTROLLED RECTI FIER WITH R, R-L & R-L-E LOAD (WITH AND WITHOUT FEEDBACK DIODE)**

To study Single phase fully controlled rectifier with R, R-L & R-L-E load (With and without feedback diode)

Expt. 5	**BUCK-BOOST CONVERTERS**
To study Buck-boost converters	
Expt. 6	**CHARACTERISTICS OF SINGLE – PHASE SE RIES INVERTER**
To study Characteristics of Single – phase series inverter	
Expt.7	**CHARACTERISTICS OF SINGLE - PHASE PAR ALLEL INVERTER WITH R & R-L LOADS**
To study Characteristics of Single - phase parallel inverter with R & R-L loads	
Expt. 8	**CHARACTERISTICS OF SINGLE - PHASE CYCLOCONVERTER (CENTRE TAPPED)**
To study Characteristics of Single - phase cycloconverter (Centre tapped)	
Expt. 9	**SINGLE PHASE DUAL CONVERTER WITH R & RL LOADS (CIRCULATING & NON-CIRCULAT ING MODES)**
To study Single phase Dual converter with R & RL loads (Circulating & Non-Circulating modes)	
Expt. 10	**3-PHASE HALF CONTROLLED RECTIFIER WITH R & R-L, R-L-E LOADS..**
. To study 3-Phase half controlled rectifier with R & R-L, R-L-E loads.	
Expt. 11	**SPEED CONTROL OF UNIVERSAL MOTOR BY USING HALF CONTROLLED 1-PHASE BRIDGE CONVERTER/ 1-PHASE AC REGULATOR.**
To study Speed control of Universal motor by using half controlled 1-phase bridge converter/ 1-phase AC regulator.	
Expt. 12	**MATLAB SIMULATION OF SPEED CONTROL OF UNIVERSAL MOTOR BY USING 1-PHASE AC REGULATOR**
To develop MATLAB simulation of Speed control of Universal motor by using 1-phase AC regulator	
Expt. 13	**MATLAB SIMULATION OF SINGLE PHASE FULLY CONTROLLED RECTIFIER WITH R & R-L, R-L-E LOADS.**
To develop MATLAB simulation of single phase fully controlled rectifier with R & R-L, R-L-E loads.	

Expt. 14	MATLAB SIMULATION OF SINGLE PHASE STEP DOWN CYCLOCONVERTER (CENTRE TAPPED)

To develop MATLAB simulation of single phase step down cycloconverter (Centre tapped)

Expt. 15	MATLAB SIMULATION OF 3-PHASE PWM IN VERTER

To develop MATLAB simulation of 3-phase PWM inverter

Reference Books

1. Power Electronics By P. S. Bimbhra, Khanna Publications.
2. Power electronics By M D Singh and K B Khanchandani by TMH publication 2 edition.

Web References

1. https://www.electrical4u.com
2. https://www.researchgate.net

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS

SOFTWARE: MATLAB 2017a

HARDWARE: Desktop Computers (05 nos)

Course Outcome

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

1. Elucidate the basic properties and operation of various power semi-conductor devices.
2. analyze and design and application of AC/DC rectifier circuit
3. design and analyze and application of DC/DC converter circuits
4. analyze DC/AC inverter circuit

ELECTRICAL SYSTEMS LABORATORY

B.Tech 6th Semester – Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16EE2607	Core	-	-	3	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 39				Total Classes: 39		

OBJECTIVES

The course should enable the students to

1. To acquire knowledge in latest software tools in electrical enginering applications
2. To analyse the performance of electrical networks by conducting various experiments

LIST OF EXPERIMENTS

Expt. 1	**SIMULATION OF A SINGLE-PHASE FULL-BRIDGE CONVERTER WITH DIFFERENT LOADS**

To study Simulation of a single-phase full-bridge converter with different loads

Expt. 2	**SIMULATION OF STATIC CHARACTERISTICS OF SCR**

To study Simulation of static characteristics of SCR

Expt. 3	**SIMULATION OF A RESONANT PULSE COM MUTATION CIRCUIT AND BUCK CHOPPER**

To Study Simulation of a resonant pulse commutation circuit and buck chopper

Expt. 4	**SIMULATION OF AN AC VOLTAGE CONTROL LER WITH VARIOUS LOADS**

To study Simulation of an AC voltage controller with various loads

Expt. 5	**SIMULATION OF A SINGLE-PHASE/THREE PHASE CYCLOCONVERTERS WITH DIFFER ENT LOADS**

To study Simulation of a single-phase/three phase Cycloconverters with different loads

Expt. 6	**SIMULATION OF SINGLE-PHASE INVERTER WITH PWM CONTROL**

To study Simulation of single-phase inverter with PWM control

Expt.7	**SIMULATION OF 3-PHASE POWER SYSTEM NET WORK CONSISTING GENERATOR, TRANSMISSION LINE AND LOAD.**

To study Simulation of 3-phase power system network consisting generator, transmission line and Load.

Expt. 8	**TRANSFER FUNCTION ANALYSIS OF A GIVEN CIRCUIT USING MATLAB & SIMULINK**

To study Transfer function analysis of a given circuit using MATLAB & SIMULINK

Expt. 9	**STATE MODEL REPRESENTATION OF TRANS FER FUNCTIONS USING MATLAB & SIMULINK**

To study State model representation of transfer functions using MATLAB & SIMULINK

Expt. 10	**DESIGN OF CONTROL SYSTEM WITH ROOT-LOCUS METHOD USING MATLAB & SIMULINK**

To study Design of control system with Root-locus method using MATLAB & SIMULINK

Expt. 11	**STABILITY ANALYSIS USING BODE, NYQUIST PLOTS**

To study Stability analysis using Bode, Nyquist plots

Expt. 12	**LOAD FLOW STUDIES USING SIMULATION OR POWER WORLD TOOL**

To perform Load flow studies using simulation or POWER WORLD tool

Expt. 13	**SHORT CIRCUIT STUDIES IN POWER SYSTEMS USING SIMULATION OR POWER WORLD TOOL**

To perform Short circuit studies in power systems using Simulation or POWER WORLD tool

Expt. 14	STEADY STATE STABILITY ANALYSIS OF POWER SYSTEMS USING SIMULATION OR POWER WORLD TOOL

To perform Steady state stability analysis of power systems using Simulation or POWER WORLD tool

Expt. 15	RELAY CO-ORDINATION IN POWER SYSTEMS USING SIMULATION TOOL

To study Relay co-ordination in power systems using Simulation tool

Reference Books

1. "Power Electronics - circuits, devices and applications", Prentice Hall of India, 2nd

   ed., 2000- Muhammad H. Rashid.

2. Power Electronics by V. R. Moorthi, Oxferd University press.

Web References

1. https://www.electrical4u.com
2. https://www.researchgate.net

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE: MATLAB2017a

HARDWARE: Desktop Computers (30 nos)

Course Outcome

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

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

MINI PROJECT

B.Tech 6th Semester – Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16EE2608	Core	-	-	-	2	25	50	75
Contact Classes: 36	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 36		

OBJECTIVES

The course should enable the students to

I. Apply the programming knowledge into a real- world situation/problem and exposed the students how programming skills helps in developing a good engineer

II. The student should gain a thorough knowledge in the problem, he/she has selected and the language / software/Hardware, he/she is using.

The Mini Project shall be carried out during 6th Semester along with other lab courses by having regular weekly slots. Students will take mini project batch-wise and the batches will be divided as per the guidelines issued. The topic of mini project should be so selected that the students are enabled to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of mini project could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with specific outcome.

Mini Project report will be evaluated for 75 marks. 25 marks for internal evaluation and 50 marks for external evaluation.

Assessment will be done by the supervisor/guide for 25 marks based on the work and presentation/ execution of the mini project.

The remaining 50 marks are based on report, presentation, execution and viva-voce. Evaluation is done by a committee comprising the mini project

supervisor, Head of the Department and external examiner appointed by the Principal from the panel of experts recommended by Chairman, BOS in consultation with Head of the Department.

Outcomes

1. Acquire practical knowledge within the chosen area of technology for project development
2. contribute as an individual or in a team in development of technical projects
3. develop effective communication skills for presentation of project related activities
4. identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach

TECHNICAL APTITUDE

B.Tech 6th Semester – Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16AS3601	-	-	-	-	1	25	50	75
Contact Classes: 36	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 36			

OBJECTIVES

The course should enable the students to

I. To ensure that students learn to think critically about mathematical models.

II. To ensure students in solving problems effectively and accurately.

III. Application of mathematical or statistical models to different real world contexts.

UNIT-I	Classes:5

Problem Solving in Commercial Mathematics

(Percentages, Profit and Loss, Discount and Interest)

UNIT-II	Classes:5

Problem Solving in advanced level of Mathematical Ability

(Ratio and Proportions, Mixtures, Time and Work, Time and Distance)

UNIT-III	Classes:7

C - language concepts

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.

UNIT-IV	Classes:8

Data Structures

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.

UNIT-V	Classes: 11

Personality Development- Personal Grooming-Dressing, Body, Language, Leadership Skills, Basic Etiquettes, Mannerism / Confidence Building - Positive Attitude/ Mind Power Training etc

HR Fundamentals- Practice of self concept.

Kinds of Interviews –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

Interview Skills - Mock Interviews [One –One, Panel, Telephonic & Skype]

Outcomes

1. Student can attempt different technical competitive exams.
2. Student can enhance technical ability and logical thinking.

PROFESSIONAL SOCIETY ACTIVITIES-IV

B.Tech 6th Semester – Electrical & Electronics Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16AS3602		-	-	-	1			
Contact Classes: 12	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 12**		

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:

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

B.Tech 7th Semester

ELECTRICAL & ELECRONICS ENGINEERING

Syllabus

Digital Signal Processing

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EC1605	Core	3	-	-	3	40	60	100
Contact Classes:65	Tutorial Classes: -		Practical Classes: Nil			Total Classes:65		

OBJECTIVES

I. To study DFT and its computation

II. To study the design techniques for digital IIR and FIR filters

III. To study the finite word length effects in digital signal processing

UNIT-I DIGITAL SIGNALS Classes:18

Introduction: 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.

Discrete Fourier Series: 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.

UNIT-II FAST FOURIER TRANSFORMS & DIGITAL FILTERS Classes:17

Fast Fourier Transforms: Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT and FFT for composite N.

Realization of Digital Filters: 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

UNIT-III FIR AND IIR DIGITAL FILTERS Classes:15

IIR Digital Filters: Analog filter approximations-Butterworth and chebyshev, design of IIR digital filters from analog filters, design examples: analog-digital transformations, Illustrative Problems.

FIR Digital Filters: 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

UNIT-IV	MULTIRATE DIGITAL SIGNAL PROCESSING	Classes:15

Multirate Digital Signal Processing Fundamentals: Basic sample rate alteration devices, Multirate Structures for sampling rate Converters, Multistage design of decimator and Interpolator, Polyphase Decomposition, Nyquist filters.

Applications of Digital Signal Processing: Spectral analysis of no stationary 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, 4th ed., 2007.

2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata McGraw Hill, 3rd

   Edition, 2009.

Reference Books

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
2. A Text book on Digital Signal processing – R S Kaler, M Kulkarni,, Umesh Gupta, I K

   International Publishing House Pvt. Ltd.

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

CO1 : Classify Discrete time signals and systems

CO2 : Apply discrete Fourier transform on time domain signals

CO3 : Analyze the signals in Time and Frequency domain through its respective tools

CO4 : design the FIR and IIR digital filters with given specifications

CO5 : Examine the frequency response characteristics of FIR and IIR digital filters

CO6 : Know the applications of Digital signal processing

POWER SYSTEM ANALYSIS

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1701	Core	3	1	-	3	40	60	100
Contact Classes:55	Tutorial Classes: 10	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

I. This course introduces formation of Y bus and Z bus of a Power System, power flow studies by various methods.

II. To deals with short circuit analysis and analysis of power system for steady state and transient stability.

UNIT-I	REPRESENTATION OF POWER SYSTEMS	Classes:15

Representation of Power Systems:

Structure of power system, functional description of different equipment's. Modeling of power system components for system studies: synchronous generator, Transformer, transmission lines and representation of loads. One line diagram of power system and its equivalent representation by impedance and reactance diagrams. Per unit quantities - definition, advantages, selection of base for the quantity, change of base, per unit computation of voltage, current, complex power, impedance; per unit reactance /impedance diagram of a power system.

UNIT-II	POWER SYSTEM IN STEADY STATE & POWER SYSTEM IN STEADY STATE	Classes:20

Power System in Steady State:

Network Model Formulation with admittance (Y-bus), load flow problem, static load flow equations using Y-bus, load flow solution using Gauss, Gauss-Seidel and NR methods (Polar and Rectangular Coordinates)

Symmetrical Fault Analysis:

Symmetrical short circuit on an unloaded synchronous generator- steady state, transient and sub transient models, representation of motors, calculation of symmetrical short circuit currents for simple systems, short circuit current computation through Thevenin's theorem, selection of circuit breakers.

UNIT-III	SYMMETRICAL COMPONENTS AND ANALYSIS OF UNBALANCED FAULTS	Classes:15

Symmetrical Components and Analysis of Unbalanced Faults: Introduction, Symmetrical component transformation, Power in terms of symmetrical components, phase shift in Star/Delta transformers, sequence impedances of transformers, transmission lines and synchronous machines, construction of sequence networks of a power system.

Unbalanced fault analysis and application of symmetrical components, shunt and series type faults, single line to ground fault, line–to-line fault, double-line – to – ground fault, open conductor faults.

UNIT-IV	POWER SYSTEM STABILITY	Classes:15

Power System Stability

Introduction, Dynamics of Synchronous machine, Power angle equation, transient and steady state stability, development of the swing equation, swing curves, transient and steady state stability limits, application of equal area criterion to one machine infinite bus and two machine power system, critical clearing angle, critical clearing time, Step by step method. Factors affecting steady state and transient stability, methods of improving stability.

Text Books

1. Modern power system analysis by D.P.Kothari and I.J.Nagrath , TMG
2. Power system Analysis by J.J.Grainger & W.D.Stevenson. Jr, TMH, 2007.

Reference Books

1. Power System Analysis by T.K.Nagsarkar M.S.Sukhija, OXFORD university press,2007
2. Electrical Power Systems by Ashfaq Hussain, CBS Publishers & Distributors.

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

CO1 : Describe the components of a power system and model the same in per unit representation

CO2 : Analyze and apply different load flow methods

CO3 : Analyze symmetrical faults to select a suitable Circuit Breaker

CO4 :Apply symmetrical components to analyze the unsymmetrical faults

CO5 :Understand and analyze different stability methods

CO6 : Analyze the state of the power system

POWER SYSTEM OPERATION AND CONTROL

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1702	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. This subject deals with Economic operation of Power Systems, Hydrothermal scheduling and modelling of turbines, generators and automatic controllers.

II. It emphasizes on single area and two area load frequency control and reactive power control.

UNIT-I	ECONOMIC OPERATION OF POWER SYSTEMS-I	Classes:20

Economic Operation of Power Systems-I: 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.

Economic Operation of Power Systems-II: Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula

UNIT-II	HYDROTHERMAL SCHEDULING & MODELING OF TURBINE & MODELING OF GOVERNOR	Classes:15

Hydrothermal Scheduling: Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, Scheduling problems-Short term hydrothermal scheduling problem.

Modeling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.

Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of small signal transfer function – Block Diagram.

UNIT-III	LOAD FREQUENCY CONTROL –I AND LOAD FREQUENCY CONTROL -II	Classes:15

Load Frequency Control –I: 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- tie-line bias control.

Load Frequency Control –II: Proportional plus Integral control of single area and its block diagram representation, steady state response – Load Frequency Control and Economic dispatch control.

UNIT-IV	Reactive Power Control	Classes:15

Reactive Power Control: Overview of Reactive Power control – Reactive Power compensation in transmission systems – advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation.

Text Books

1. A. Chakravarthi and S. Halder “Power System Analysis Operation and Control”, 3rdEdition, 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

CO1: Understand the concepts of economic operation of power plants

CO2: Illustrate the operation of speed-governing system

CO3: Understand and analyze the concept of single area load frequency control

CO4:Understand and analyze the concept of two area load frequency con trol

CO5: Apply various control strategies for reactive power control

RENEWABLE ENERGY SOURCES (Elective – II)

B.Tech 7th Semester: Electrical & Electronics Engineering (Open Elective)								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1707	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. This course is introduced to get familiar with solar energy, its radiation, collection, storage and application.

II. It also introduces the Wind energy, Biomass energy, geothermal energy and ocean energy as alternative energy sources.

UNIT-I	SOLAR ENERGY	Classes:18

Solar Energy: Role and potential of new and renewable sources, the solar constant, solar radiation at the earth's surface, solar energy collectors, classification of flat plate and concentrating collectors, advantages and disadvantages of concentrating collectors over flat plate collectors, solar energy storage systems, Solar Applications- solar heating/cooling technique, solar distillation and drying and solar photo voltaic.

UNIT-II	WIND ENERGY	Classes:15

Wind Energy: Sources and potentials, basic principles of wind energy conversion, performance characteristics, Betz criteria, basic components of a WECS, classification of WECS systems, advantages and disadvantages of WECS, types of wind machines, and applications of wind energy.

UNIT-III	ENERGY FROM BIO-MASS & GEOTHERMAL ENERGY	Classes:15

Energy from Bio-Mass & Geothermal Energy: Biomass conversion technologies, factors affecting bio digestion, types of Bio-gas plants, materials used for bio gas generation, selection of site for a bio gas plant, starting a bio gas plant, filling a digester for starting, fuel properties of bio gas and utilization of bio gas, Resources, types of wells, methods of harnessing the energy, potential in India.

UNIT-IV	ENERGY FROM OCEANS & DIRECT ENERGY CONVERSION	Classes:17

Energy from Oceans: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, and principles of DEC.Thermo-electric generators, See back, Peltier and Joule Thomson effects

Text Books

1. G.D. Rai "Non-Conventional Energy Sources", Khanna Publishers, 2009.
2. Tiwari and Ghosal "Renewable energy resources", Narosa. 2005.

Reference Books

1. John Twidell & Tony Wier "Renewable Energy Resources", CRC Press (Taylor & Francis)
2. Ramesh & Kumar "Renewable Energy Technologies", Narosa.

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

CO1 : Understand various energy conversion technologies of renewable energy sources

CO2 : understand different harnessing and storage methods of solar energy

CO3 : understand the concepts of wind energy conversion systems

CO4 : select the site and install bio plant for biogas production

CO5 : get knowledge on concepts of Ocean, tidal and wave energy

CO6 : find green energy solutions so as to deal with environmental pollution

ENERGY AUDITING (Elective – II)

B.Tech 8th Semester: Electrical & Electronics Engineering (Open Elective)								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1708	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. This subject deals with the energy auditing, conservation, management techniques, measurements in energy audits. Information about how to improve the power factor & efficiency of electrical equipment's.

II. It also deals with cogeneration plants and Electric water heating.

UNIT-I	SYSTEM APPROACH, END USE APPROACH TO EFFICIENT USE OF ELECTRICITY; ELECTRICITY TARIFF TYPES. ENERGY AUDITING	Classes:17

System approach, end use approach to efficient use of Electricity; Electricity tariff types. Energy auditing: Types and objectives, audit instruments, ECO assessment and Economic methods, Specific energy analysis, Minimum energy paths, consumption models, Energy auditing of a typical industrial unit - case studies.

UNIT-II	ELECTRIC MOTORS	Classes:15

Electric motors: Energy efficient controls and starting efficiency, motor efficiency and Load analysis, Energy efficient / high efficient Motors - Case studies; Load Matching and selection of motors. Variable speed drives. Pumps and Fans: Efficient Control strategies-optimal selection and sizing, optimal operation and storage - case studies

UNIT-III	TRANSFORMER LOADING/ EFFICIENCY ANALYSIS, FEEDER/ CABLE LOSS EVALUATION, CASE STUDIES. REACTIVE POWER MANAGEMENT	Classes:16

Transformer Loading/Efficiency analysis, feeder/cable loss evaluation, case studies. Reactive power management: Capacitor Sizing, Degree of Compensation, Capacitor losses, Location-placement-Maintenance, case studies; Peak Demand control methodologies, types of Industrial loads, optimal Load scheduling, case studies; Lighting: Energy efficient light sources, Energy conservation in Lighting Schemes, Electronic ballast, Power quality issues, Luminaries, case studies.

UNIT-IV	COGENERATION & ELECTRIC WATER HEATING	Classes:17

Cogeneration: Types and Schemes, optimal operation of cogeneration plants, case studies. Electric loads of Air conditioning and Refrigeration, Energy conservation measures, Cold storage types – Optimal operation, case studies;

Electric water heating: Geysers, Solar Water Heaters, Power Consumption in Compressors, Energy conservation measures; Electrolytic Process; Computer Controls - software - EMS.

Text Books

1. Industrial Energy Management: Principles and Applications by Giovanni Petrecca, The Kluwer international series-207 (1999)
2. Economy Loading of Power plant and Electric systems by M.J. Steinburg and T.H. Smith, John Willey and sons

Reference Books

1. Energy-Efficient Electric Motors and their applications by Howard E.Jordan, Plenum publishing corp; 2nd ed. (1994)
2. Energy Management Hand book by Turner, Wayne C, Lilburn, The Fairmont press, 2001

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

CO1 : Acquire the knowledge of fundamentals of economic operation of an electrical system

CO2 : Acquire the knowledge of basic principles of energy auditing, types and objectives, instruments used

CO3 : To learn energy efficient control methods and schemes for improve ment of starting efficiency in electrical motors

CO4 : Understand efficient control strategies, optimal selection, sizing, op eration of variable speed drives like pumps and fans

CO5 : Acquire the knowledge of analysis of Transformer loading and Feeder loss evaluation methods, scheme for reactive power man agement, energy efficient illumination system

CO6 : Acquire the knowledge of different types and schemes of cogenera tion

HVDC AND FACTS (Elective – III)

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1703	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

I. This course is introduced to the students to get familiar with the FACTS (Flexible AC Transmission System) and HVDC (High Voltage Direct Current) which are controllable devices whose functions are to enhance the security, capacity and flexibility of power transmission systems.

II. Application of these components in power systems implies an improvement of Transient stability, Voltage stability, Damping of power oscillations, optimal power flow.

UNIT-I	ANALYSIS OF HVDC CONVERTERS AND HVDC SYSTEM CONTROL	Classes:20

Introduction: DC power transmission- Introduction – types of DC links- Comparison of AC and DC transmission – Application of DC transmission – Description of DC transmission system - Planning for HVDC transmission- typical layout of a HVDC converter station.

Analysis of HVDC Converters and HVDC System Control: Pulse number, choice of converter configuration – characteristics of a twelve pulse converter detailed analysis of converters. General principles of DC link control – Converter control characteristics – System control hierarchy - Firing angle control – Current and extinction angle control.

UNIT-II	HARMONICS, FILTERS, REACTIVE POWER CONTROL	Classes:15

Harmonics, Filters, Reactive Power Control: Introduction, generation of Harmonics, AC and DC Filters, Reactive power requirements at steady state, sources of Reactive power static VAR systems.

HVDC Cables: Introduction to DC cables – Basic physical phenomenon arising in DC insulation

UNIT-III	FACTS CONCEPTS	Classes:15

FACTS Concepts: Flow of power in AC parallel paths and Meshed systems, Basic types of FACTS controllers, Brief description and Definitions of FACTS controllers.

Static VAR Compensator (SVC) and Applications: Voltage control by SVC – Advantages of slope in dynamic characteristics – Design of SVC voltage regulator.

UNIT-IV	THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS & VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS	Classes:15

Thyristor Controlled Series Capacitor (TCSC) and Applications: Operation of the TCSC – Different modes of operation-Modeling of TCSC.

Voltage Source Converter based FACTS Controllers: Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics

Text Books

1. Padiyar, K. R., "HVDC power transmission system", Wiley Eastern Limited, New Delhi 1990. First edition.
2. Edward Wilson Kimbark, "Direct Current Transmission", Vol. I, Wiley interscience, New

York, London, Sydney, 1971.

Reference Books

1. K R Padiyar, "FACTS controllers in power transmission and distribution," New Age International Publishers, New Delhi 2007.
2. T.J.E Miller, "Reactive Power Control in Electric Systems", John Wiley & Sons, 1986.

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

CO1: understand the importance of Transmission power through HVDC

CO2: Ability to calculate power conversion between Ac to DC and DC to AC

CO3 :Describe various control schemes in HVDC

CO4 :Analyze the harmonics and design the filters for HVDC

CO5 :Understand basic concept of FACTS controllers and their applica tions

CO6: Analyze the Operation of various FACTS controllers (SVC, TCSC, STATCOM)

NEURAL NETWORKS AND FUZZY LOGIC (Elective – III)

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1704	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.

II. To deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components along with Genetic Algorithms.

III. The Application of Soft Computing Techniques to Electrical Engineering is also presented.

UNIT-I	ARTIFICIAL NEURAL NETWORKS AND ITS ESSENTIALS	Classes:20

Artificial Neural Networks and Its Essentials: 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.

UNIT-II	LEARNING AND ASSOCIATIVE MEMORY NETWORKS	Classes:15

Learning and Associative Memory Networks: 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.

UNIT-III	FUZZY LOGIC	Classes:15

Fuzzy Logic: 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.

UNIT-IV	GENETIC ALGORITHMS AND AI APPLICATIONS TO ELECTRICAL SYSTEMS	Classes:15

Genetic Algorithms and AI Applications to Electrical Systems: Introduction, Basic Operators and Terminologies in GA, Traditional Vs Genetic Algorithm, Encoding, Fitness Function, Reproduction, Crossover, Mutation Operator.

ANN based Short term Load Forecasting, Load flow Studies, Fuzzy logic based Unit Commitment and 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

CO1: Demonstrate knowledge in Neural networks

CO2: Understand the concepts of fuzzy logic controllers

CO3: Demonstrate knowledge in Design of fuzzy controllers

CO4: Design Adaptive fuzzy controllers

CO5: Apply fuzzy logic and neural networks for real time systems

CO6: Gain knowledge about basic operators in Genetic Algorithm and its implementation

PLCs AND SCADA (Elective – III)

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1705	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. This course introduces a prior knowledge about the basics of PLCs, Digital logic gates, data handling functions, and controlling of robots with PLCs.

II. To deals with Associate of SCADA-Supervisory Control And Data Acquisition

III. To Desirable Properties of SCADA system, features, advantages, disadvantages and applications of SCADA. SCADA Architectures (First generation - Monolithic, Second generation - Distributed, Third generation – Networked Architecture), SCADA systems in operation and control of interconnected power system.

UNIT-I	AUTOMATION	Classes:13

AUTOMATION: Introduction to Automation, Definition, History of Automation, Role of Automation, Industrial Applications

UNIT-II	AUTOMATION COMPONENTS	Classes:17

AUTOMATION COMPONENTS: Automations Components, Relays, Concept of relays, Relay wiring for logic gates, Switches and its types, Sensors, Optical Sensors, Capacitive Sensors, Inductive Sensors

UNIT-III	PROGRAMMABLE LOGIC CONTROLLER	Classes:15

PLC-PROGRAMMABLE LOGIC CONTROLLER: Introduction to PLC (Programmable logic controller), Advantages of PLC control Panel, Architecture of PLC,Functions of various Blocks that make PLC, Working principle of PLC ,Memory types , Different types of Input/Output circuits **Applications:** Tank level control, ON OFF temperature control

UNIT-IV	SUPERVISORY CONTROL AND DATA ACQUISITION	Classes:20

SCADA-SUPERVISORY CONTROL AND DATA ACQUISITION: Introduction, definitions and history of Supervisory Control and Data Acquisition, typical SCADA system Architecture, 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), SCADA systems in operation and control of interconnected power system.

Text Books

1. Gary Dunning, "Introduction to Programmable Logic Controllers", Thomson, 2nd Edition
2. Stuart A Boyer, "SCADA supervisory control and data acquisition", ISA, 4th Revised edition

Reference Books

1. Batten G. L., "Programmable Controllers", McGraw Hill Inc., Second Edition
2. John R. Hackworth, Frederick D., Hackworth Jr., "Programmable Logic Controllers Programming Methods and Applications", PHI Publishers

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

CO1: Identify basic components of PLCs, their architecture & programming

CO2: Exemplifying different levels of File I / O& Ladder Logic diagram of PLCs

CO3: Apply PLCs for different real time applications

CO4: Contrast the interface of PLCs & SCADA for Industrial Automation

CO5: Summarize various animations, alarming functions, data logging and event detection in SCADA

CO6: Develop real time platform for various process applications

AVAILABLE SELECTED MOOCS (Elective – III)

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1706	Core	3	1	-	3	40	60	100
Contact Classes: -	Tutorial Classes: -	Practical Classes: Nil				Total Classes: -		

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

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.

DIGITAL SIGNAL PROCESSING LABORATORY

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16EC2614	Core	-	-	3	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 39			Total Classes: 39			

OBJECTIVES

The course should enable the students to

Practical implementation of the convolution, correlation, DFT, IDFT, Block convolution, Signal smoothing, filtering of long duration signals, and Spectral analysis of signals

LIST OF EXPERIMENTS

Expt. 1 **DSP chips – TMS 320C 5X/6X Instructions.**

To study the architecture of DSP chips – TMS 320C 5X/6X Instructions

Expt. 2 **DSP chips – TMS 320C 5X/6X Instructions.**

To study the architecture of DSP chips – TMS 320C 5X/6X Instructions.

Expt. 3 **Circular convolution**

To verify the circular convolution

Expt. 4 **FIR filter (LP/HP) using windowing technique**

To design FIR filter (LP/HP) using windowing technique

a) Using rectangular window

b) Using triangular window

c) Using Kaiser window

Expt. 5 **IIR filter (LP/HP) on DSP Processors**

To Implement IIR filter (LP/HP) on DSP Processors

Expt. 6 **N-point FFT algorithm**

To Implement N-point FFT algorithm

Expt.7 **MATLAB program to generate sum of sinusoidal signals**Simulink program to generate sum of sinusoidal signals

Expt. 8	MATLAB program to find frequency response of analog LP/HP filters

Simulink program to find frequency response of analog LP/HP filters

Expt. 9	Compute power density spectrum of a sequence

To compute power density spectrum of a sequence

Expt. 10	FFT of given 1-D signal and plot

To find the FFT of given 1-D signal and plot

Reference Books

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education/PHI, 4th ed., 2007.
2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata McGraw Hill, 3rd Edition, 2009.

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 (04 nos)

Course Outcome

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

1. To know about programming with TMS320C 5X/6X
2. To know about convolution and windowing techniques using MATLAB programming
3. To know about LP/HP filter frequency responses.

POWER SYSTEM LABORATORY

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
16EE2709	Core	L	T	P	C	CIA	SEE	Total
		-	-	3	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 39				Total Classes: 39		

OBJECTIVES

The course should enable the students to:

I. To analyse the performance of power system networks by conducting various experiments.

II. To study different power system protective equipment by conducting suitable experiments.

III. To develop computer programs for analysis of power systems.

LIST OF EXPERIMENTS

Expt. 1 **ADMITTANCE MATRICES (Y BUS)**

Formation of admittance matrices (Y bus) using MATLAB

Expt. 2 **BUS IMPEDANCE MATRICES (Z BUS)**

Formation of bus impedance matrices (Z bus) using MATLAB

Expt. 3 **GAUSS-SEIDEL LOAD FLOW ANALYSIS**

Develop MATLAB program for Gauss-Seidel load flow analysis

Expt. 4 **NEWTON-RAPHSON LOAD FLOW ANALYSIS**

Develop MATLAB program for Newton-Raphson load flow analysis

Expt. 5 **SHORT CIRCUIT ANALYSIS**

Develop MATLAB program for short circuit analysis

Expt. 6 **FAST DECOUPLED LOAD FLOW ANALYSIS**

Develop MATLAB program for Fast decoupled load flow analysis

Expt.7 **ECONOMIC LOAD DISPATCH IN POWER SYSTEMS**

Develop MATLAB program for Economic load dispatch in power systems

Expt. 8 **PARAMETERS OF TRANSMISSION LINE**

Computation of parameters of transmission line

Expt. 9 **LOAD – FREQUENCY CONTROL OF SINGLE AREA POWER SYSTEMS**

Simulink modeling for Load – frequency control of single area power systems

Expt. 10 LOAD – FREQUENCY CONTROL OF TWO AREA POWER SYSTEMS

Simulink modeling for Load – frequency control of two area power systems

Expt. 11 Transient Stability Analysis Of SMIB

Simulink modeling for Transient stability analysis of SMIB

Reference Books

1. Dr. Shailendra Jain "Modeling & simulation using matlab & simulink", Wiley India Pvt. Limited.
2. 2. D. P. Kothari, I.J. Nagrath "Modern power system analysis", Tata McGraw-Hill.
3. Roy Billinton "Power system reliability evaluation", Taylor & Francis.

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, WPL soft Software

HARDWARE: Desktop Computers (04 nos)

Course Outcome

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

CO1: Find bus admittance and impedance matrices for different bus sys tems in MATLAB environment

CO2: Calculate transmission line parameters and load flow studies in MATLAB environment

CO3: Analyze simulation results for single are and two area load frequency control in MATLAB environment

CO4: Estimate short circuit currents under abnormal conditions in MATLAB environment

CO5: Acquire expertise in usage of MATLAB/ Simulink tools

CO6: Exhibit professional behavior

POWER ELECTRONIC CONVERTORS AND DRIVES LAB

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16EE2710	Core	-	-	3	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 39				Total Classes: 39		

OBJECTIVES

The course should enable the students to

I. The main objective of power converters and drives lab is to familiarize the students with latest converters based on power semiconductor devices.

II. 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

Expt. 1	**SIMULATION OF 1-PHASE FULLY CONTROLLED BRIDGE CONVERTER WITH R&R-L LOADS**

Simulation of 1-phase fully controlled bridge converter with R& R-L loads

Expt. 2	**SIMULATION OF 3-PHASE FULLY CON TROLLED BRIDGE CONVERTER WITH R& R-L LOADS**

Simulation of 3-phase fully Controlled Bridge converter with R& R-L loads

Expt. 3	**SIMULATION OF 3-PHASE AC VOLTAGE CON TROLLER WITH R& R-L LOADS**

Simulation of 3-phase AC Voltage controller with R& R-L loads

Expt. 4	**SIMULATION OF 1-PHASE FULLY CON TROLLED BRIDGE CONVERTER FED DC MO TOR (SEPARATELY EXCITED) DRIVE**

Simulation of 1-phase fully controlled bridge converter fed DC Motor (separately excited) drive

Expt. 5	**SIMULATION OF 3-PHASE FULLY CON TROLLED BRIDGE CONVERTER FED DC MO TOR (SEPARATELY EXCITED) DRIVE**
Simulation of 3-phase fully controlled bridge converter fed DC Motor (separately excited) drive	
Expt. 6	**SIMULATION OF SINE- PWM INVERTER**
Simulation of Sine- PWM inverter	
Expt.7	**SIMULATION SPEED CONTROL OF DC MOTOR USING BJT-H BRIDGE INVERTER USING MATLAB**
Simulation Speed control of DC motor using BJT-H Bridge Inverter using MATLAB	
Expt. 8	**SIMULATION OF CHOPPER FED DC MOTOR DRIVE USING MATLAB**
Simulation of Chopper fed DC motor drive using MATLAB	
Expt. 9	**SIMULATION OF BUCK CONVERTER USING MATLAB**
Simulation of Buck converter using MATLAB	
Expt. 10	**SIMULATION OF 5- LEVEL MULTILEVEL IN VERTER USING MATLAB**
Simulation of 5- Level Multilevel Inverter using MATLAB	
Expt. 11	**SIMULATION OF 7- LEVEL H-BRIDGE IN VERTER USING MATLAB**
Simulation of 7- Level H-Bridge Inverter using MATLAB	
Expt. 12	**SIMULATION OF 1-PHASE AC VOLTAGE CON TROLLER WITH R& R-L LOADS**
Simulation of 1-phase AC Voltage controller with R& R-L loads	

Reference Books

1. Dr. Shailendra Jain, "Modeling & simulation using matlab & simulink", Wiley India Pvt. Limited.
2. 2. G.K.Dubey "Power semiconductor controlled drives", Prentice Hall PTR.
3. 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)

Course Outcome

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

CO1: Solve electrical engineering problems associated with electric drive systems and electric machines

CO2: Analyze electrical engineering problems associated with grid con nected power electronic devices

CO3: Perform experiments on AC and DC drives using appropriate Simulink tools

CO4: Create models and analyze the simulated results of multilevel con verters

CO5: Acquire expertise in usage of MATLAB/ Simulink tools

CO6: Exhibit professional behavior

INTERNSHIP

B.Tech 7th Semester – Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16AS3701	Core	-	-	-	2	25	-	25
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 68				Total Classes: 68		

OBJECTIVES

The course should enable the students to

I. Assist the student's development of employer-valued skills such as teamwork, communications and attention to detail

II. Expose the student to the environment and expectations of performance on the part of accountants in professional accounting practice, private/public companies or government entities.

III. Expose the student to professional role models or mentors who will provide the student with support in the early stages of the internship and provide an example of the behaviors expected in the intern's workplace.

There shall be 60 hours duration to complete summer internship during summer vacations. The total internal weightage for internship course is 25 marks and will be evaluated based on day to day assessment by concern industry.

The external examination shall be evaluated by the two senior faculties (i.e one faculty act as external examiner and other one as internal examiner) for 50 marks based on the his/her report and presentation

Course Outcome

1. An internship motivate you to create opportunities, embrace new ideas, and give direction to positive change
2. Enhance some of the skills that are transferable to any professional work setting.
3. Applied your knowledge, skills, experience to a work environment
4. Developed self-understanding, self-discipline, maturity and confidence.
5. Reflected on the content and process of the learning experience

PROFESSIONAL ACTIVITIES-V

B.Tech 7th Semester: Electrical & Electronics Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16AS3702	-	-	-	-	1	-	-	-
Contact Classes: 12	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 12			

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:

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

ELECTRICAL DISTRIBUTION SYSTEMS (Elective – IV)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1801	Core	3	1	-	3	40	60	100
Contact Classes:55	Tutorial Classes: 10	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. This course is introduced to the students to get familiar with the classification of Distribution systems

II. To design considerations of distribution feeders, location of substations, improving power factor and voltage stability.

UNIT-I	GENERAL CONCEPTS AND D.C DISTRIBUTION SYSTEM	Classes:18

General Concepts: Introduction to electrical power distribution systems, Load modeling and characteristics. Coincidence factor, contribution factor loss factor -Relationship between the load factor and loss factor. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

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

UNIT-II	A.C. DISTRIBUTION SYSTEMS & SUBSTATIONS	Classes:17

A.C. Distribution Systems: Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system. Voltage drop calculations (Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to load voltages.

Substations: Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations. Classification of substations: Air insulated substations - Indoor &Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar double breaker one and half breaker system with relevant diagrams.

UNIT-III	POWER FACTOR AND VOLTAGE CONTROL & SYSTEM ANALYSIS:	Classes:15

Power Factor and Voltage Control: Causes of low P.f -Methods of Improving P.f -Phase advancing and generation of reactive KVAR using static Capacitors-Most economical p.f. for constant KW load and constant KVA type loads, Problems. Dependency of Voltage on Reactive Power flow – Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers.

System Analysis: Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

UNIT-IV	COMPENSATION FOR POWER FACTOR IMPROVEMENT & PROTECTION AND COORDINATION OF DISTRIBUTION SYSTEMS	Classes:15

Compensation for Power Factor Improvement: Capacitive compensation for power-factor control -effect of shunt capacitors (Fixed and switched), Power factor correction- Economic justification -Procedure to determine the best capacitor location.

Protection and Coordination of Distribution Systems: Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, line sectionalizes, and circuit breakers Coordination of Protective Devices: General coordination procedure.

Text Books

1. Turan Gonen "Electric Power Distribution system, Engineering", Mc Graw-hill Book Company, 2007.
2. A.S. Pabla "Electric Power Distribution", Tata Mc Graw-hill Publishing Company, 4th edition, 1997.

Reference Books

1. Dr. M. K. Khedkar and Dr. G. M. Dhole "Electric Power Distribution Automation", University Science Press.
2. V. Kamaraju "Electrical Power Distribution Systems", Right Publishers.

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

CO1: Understand the concepts of power distribution system

CO2: Design considerations of substations

CO3: Design considerations of primary and secondary distribution systems

CO4: Apply various protective devices and their coordination to distribu tion system

CO5: Evaluate voltage drop and line loss calculations

CO6: Select the appropriate size of capacitors for power factor improve ment

OPTIMIZATION TECHNIQUES (Elective – IV)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1802	Core	3	1	-	3	40	60	100
Contact Classes:55	Tutorial Classes: 10	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

This course is an introduction to optimization techniques and linear programming, constrained and unconstrained nonlinear programming and dynamic programming.

UNIT-I	LINEAR PROGRAMMING	Classes:20

Linear Programming: Introduction and formulation of models, convexity, simplex method, bid method, two phase method, degeneracy, nonexistent and unbounded solutions, duality in linear programming, dual simplex method, sensitivity analysis, revised simplex method, transportation and assignment problems.

UNIT-II	NONLINEAR PROGRAMMING	Classes:15

Nonlinear Programming: Classical optimization methods, equality and inequality constraints, Lagrange multipliers and Kuhn-Tucker conditions, quadratic forms, quadratic programming and Beale?s method.

UNIT-III	SEARCH METHODS	Classes:15

Search Methods: One dimensional optimization, sequential search, Fibonacci search, multi-dimensional search method, univariate search, gradient methods, steepest descent / ascent methods, conjugate gradient method, Fletcher – Reeves method, penalty function approach.

UNIT-IV	DYNAMIC PROGRAMMING	Classes:15

Dynamic Programming: Principle of optimality recursive relation, solution of linear programming problem, simple examples

Text Books

1. Engineering Optimization: Theory and Practice by S.S.Rao, 3rd Ed., New Age International,1998
2. Optimization Methods in Operations Research and Systems Analysis by K.V.Mittal and C. Mohan, 3rd Ed, New Age International, 1996.

Reference Books

1. Non-linear Programming by P.L. Mangassarian
2. Operations Research by S.D.Sharma

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

CO1: State the optimization problem

CO2: Solve optimization problems using linear programming

CO3: Solve optimization problems using nonlinear programming

CO4: Distinguish constrained and unconstrained optimization problem

CO5: Apply penalty factors in the process of limit violations

CO6: Select suitable optimization technique for specific optimization problem

OOPS THROUGH JAVA (Elective – IV)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16CS1506	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

The course should enable the students to

I. The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism

II. Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collection

III. How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.

UNIT-I	INTRODUCTION	Classes:15

Introduction: Differences between C and java, Features of java, datatypes, variables, arrays, operators, control statements, simple Java program, Input and output in java.

Introducing OOP: Problems in procedural oriented programming, Features of oop, Classes and objects creation, Constructors, Methods, static keyword, this keyword, passing & returning objects from methods, Recursion, Using String class methods, Command line arguments.

UNIT-II	INHERITANCE	Classes:15

Inheritance: Inheritance basics, Using super, Access specifiers, Types of inheritances, method overriding.

Abstract, Final & Interfaces: Abstract class & methods, Final class & Methods, Interfaces.

Packages: Package creation, Access Protection, Importing Packages.

The Applet Class: Applet basics, Simple applet creation.

UNIT-III	EXCEPTION HANDLING	Classes:15

Exception Handling : Exception Handling Fundamentals, Handling exceptions with try, catch, finally, throw & throws clause, Types of exceptions.

Multithreading: Uses of threads, creating & Running Threads, Thread life cycle.

UNIT-IV	Classes:15

Graphics programming using AWT: AWT, Event Delegation Model, Listeners & Listener Methods, Creating Frames, Check boxes, Radio buttons, TextField, TextArea, Label, Choice, List, Scrollbar, Handling mouse & keyboard events.

Layout Managers: Flow Layout, Border Layout, Card Layout, Grid Layout, Box Layout.

Text Books

1. Herbert Schildt, The Complete Reference Java J2SE 7th Edition, TMH Publishing Company Ltd, NewDelhi.
2. H.M.Dietel and P.J.Dietel, Java How to Program, Sixth Edition, Pearson Education/PHI.

Reference Books

1. Cay.S.Horstmann and Gary Cornell, Core Java 2, Vol 1, Fundamentals, Seventh Edition, Pearson Education.
2. R. Nageswara Rao, Core Java, An Integrated Approach, First Edition, DreamTech press

Web References

1. https://beginnersbook.com/2013/04/oops-concepts/
2. https://www.journaldev.com/12496/oops-concepts-java-example

E-Text Books

1. *https://zodml.org/sites/default/files/Object_Oriented Programming_ using_Java_0.pdf*
2. https://bookboon.com/en/object-oriented-programming-using-java-ebook

Outcomes

1. Solve problems using object oriented approach and implement them using Java.
2. Keep the related class of code together to create a package and im port the same for future application development.
3. Implement multiple inheritances using interface concept.
4. Handle runtime errors through exception handling mechanism.
5. Explore concepts of concurrent programming by using multi thread ing.
6. Create user friendly interface using Applets, Event handlers and swings

EMBEDDED SYSTEMS (Elective – IV)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EC1813	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

I. To become familiar with the logic components that comprises an embedded system

II. To design a complete microprocessor-based hardware/software system

UNIT-I	INTRODUCTION TO EMBEDDED SYSTEMS	Classes:20

Introduction to Embedded Systems: design challenges, processor technology, IC technology, design technology, tradeoffs, single purpose processor, RT level combinational logic, sequential logic (RT level) custom single purpose processor design, optimizing custom single purpose processors. General purpose processors: basic architecture, pipelining, programmers view, development environment, ASIPS, microcontrollers and digital signal processors

UNIT-II	STATE MACHINE AND CONCURRENT PROCESS MODELS	Classes:15

State Machine and Concurrent Process Models: models vs. languages, FSMD, using state machines, PSMM, concurrent process model, concurrent processes, communication and synchronization among processes, data flow model and real-time systems. Need for communication interfaces, RS232/UART, RS422/RS485, USB, Infrared, IEEE 802.11, and Bluetooth.

UNIT-III	Basic Embedded System and RTOS Concepts	Classes:15

Basic Embedded System and RTOS Concepts: Architecture of kernel, tasks and task scheduler, interrupt service routines, semaphores, mutex. Mail boxes, message queues, event registers, pipes and signals.

UNIT-IV	ADVANCED EMBEDDED SYSTEM AND RTOS CONCEPTS	Classes:15

Advanced Embedded System and RTOS Concepts: Timers, memory management, priority inversion problem, embedded OS and real time OS, RT Linux, and Handheld OS. HW / SW co- design.

Text Books

1. Frank Vahid, Tony D Givargis, Embedded system design – A unified HW/ SW Introduction, John Wiley& sons 2002.
2. KVKK Prasad, Embedded and real time systems, Dreemtech Press, 2005.

Reference Books

1. Raj Kamal, Embedded system architecture, programming and design, TM edition.
2. Mohammad Ali Mazidi, Janice G., The 8051 microcontroller and embedded systems, Pearson

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

CO1: Describe the design methodology of embedded system

CO2: Distinguish various computational models

CO3: Explain the architecture of kernel and its objects

CO4: Classify embedded operating systems

CO5: Discuss the architecture of general purpose processor

CO6: Implement the communication interfaces for embedded applications

MODERN CONTROL THEORY (Elective – V)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1803	Core	3	1	-	3	40	60	100
Contact Classes:55	Tutorial Classes: 10	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. This subject deals with state space, describing function, phase plane and Stability analysis including controllability and observability.

II. To Deals with modern control and optimal control systems.

UNIT-I	STATE VARIABLE DESCRIPTION & CONTROLLABILITY AND OBSERVABILITY	Classes:18

State Variable Description: Concept of State – State Equations for Linear Continuous time Models – Non uniqueness of state model – State diagrams for continuous time State models – Solution of state equations, State Equations for Dynamic systems – State transition matrix.

Controllability and Observability: Tests for controllability and observability for continuous time systems – Time invariant case, Principle of Duality, Controllability and observability of state models in Jordan canonical form and other canonical forms.

UNIT-II	STATE FEEDBACK CONTROLLERS AND OBSERVERS	Classes:17

State Feedback Controllers and Observers: Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement. Full order observer and reduced order observer.

Non Linear Systems: Introduction to nonlinear systems, Types of nonlinearities, Properties of Non Linear Systems – Describing function – describing function analysis of nonlinear systems- Stability analysis of Non – Linear systems through describing functions.

UNIT-III	DESCRIBING FUNCTION ANALYSIS & PHASE-PLANE ANALYSIS	Classes:15

Describing Function Analysis: Derivation of describing functions for Dead zone, Saturation, backlash, relay with dead zone and Hysteresis – Jump Resonance.

Phase-Plane Analysis: Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, Singular points, Phase-plane analysis of nonlinear control systems.

UNIT-IV	Stability Analysis & Design of PD/PI/PID Controller	Classes:15

Stability Analysis: Stability in the sense of Lyapunov. Lyapunov's stability and Lyapunov's instability theorems. Direct method of Lyapunov for the Linear and Nonlinear continuous time autonomous systems.

Design of PD/PI/PID Controller: Design of PD, PI and PID controllers in frequency domain and using root locus technique.

Text Books

1. M. Gopal "Modern Control System Theory", New Age International Publishers, 2nd Edition, 1996.
2. Stainslaw H. Zak "Systems and Control", Oxford Press, 2003.

Reference Books

1. K. Ogata "Modern Control Engineering", Prentice Hall of India, 3rd edition, 1998.
2. I.J. Nagarath and M.Gopal "Control Systems Engineering", New Age International (P) Ltd.

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

CO1: Understand state space analysis of linear time invariant and time variant systems

CO2: Assess controllability, observability and stability of a given system

CO3: Analyze different types of non-linearities

CO4: Analyze non-linear systems using describing function and phase plane analysis

CO5: Design full order and reduced order observers

CO6: Understand the concept of Lyapunov Stability

SMART GRID (Elective – V)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1804	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. This course is helpful for the students to learn how to collect, transmit and store data to manage supply and demand by using grid and a network of computers.

II. To design a micro grid system control and power quality Management in Smart Grid.

UNIT-I	INTRODUCTION TO SMART GRID	Classes:15

Introduction to Smart Grid

Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Drivers of SG in India, Challenges for SG, Difference between conventional & smart grid, Smart Grid Vision & Roadmap for India, Concept of Resilient and Self-Healing Grid, Present development & International policies in Smart Grid, Smart Cities, Pilot projects in India.

UNIT-II	SMART GRID TECHNOLOGIES & SMART METERS AND ADVANCE METERING INFRASTRUCTURE	Classes:20

Smart Grid Technologies

Remote Terminal Unit (RTU), Intelligent Electronic Devices (IED), Phase Measurement Unit (PMU). Smart Substations, Substation and Feeder Automation, application for monitoring, protection and control, Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid(V2G), Grid to vehicles(G2V), Smart storage technologies – Battery(flow and advanced), SMES, Super Capacitors, Pumped Hydro, Compressed Air Energy Storage(CAES) and its comparison, Optimal Location of PMUs for Complete Observability.

Smart Meters and Advance Metering Infrastructure

Introduction to Smart Meters, Advanced Metering Infrastructure (AMI), Real Time Prizing, Automatic Meter Reading (AMR), Outage Management System (OMS) Smart Sensors, Smart Appliances, Home & Building Automation, Geographic Information System (GIS).

UNIT-III	MICRO GRIDS & POWER QUALITY MANAGEMENT IN SMART GRID	Classes:15

Micro grids

Concept of Micro grid, need & applications of Micro grid, Micro grid Architecture, DC Micro grid, Formation of Micro grid, Issues of interconnection, protection & control of Micro grid, Integration of renewable energy sources, Smart Micro grid, Micro grid and Smart Grid Comparison, Smart Micro grid Renewable Green Energy System, Cyber Controlled Smart Grid

Power Quality Management in Smart Grid:

Power Quality and EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit

UNIT-IV	COMMUNICATION TECHNOLOGY FOR SMART GRID:	Classes:15

Communication Technology for Smart Grid

Communication Architecture of SG, Wide Area Measurement System (WAMS), Home Area Network (HAN), Neighborhood Area Network (NAN), Wide Area Network (WAN). Bluetooth, ZigBee, GPS, Wi-Fi, Wi-Max based communication, Wireless Mesh Network, Basics of CLOUD Computing & Cyber Security for Smart Grid, Broadband over Power line (BPL), IP based protocols.

Text Books

1. Ali Keyhani, Mohammad N. Marwali, Min Dai "Integration of Green and Renewable Energy in Electric Power Systems", Wiley
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response",CRC Press

Reference Books

1. Nikos Ziargyriour, "Micro grid, Architecture and Control", IEEE Press, Wiley Publications.
2. Yang Xiao, "Communication and Networking in Smart Grids", CRC Press, Taylor and Francis group

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

CO1: Understand the basic concepts of Smart Grid and its important ter minology

CO2: Identify the challenges and possibilities related to smart meters

CO3: gain the knowledge about intelligent architecture for the smart grid

CO4: Identify the telecommunication infrastructure needed for its operation

CO5: Operate the system in an energy efficient manner

CO6: carry out a case study based on technical-economic factors to dis cuss pros and cons of grid deployment and exploitation

POWER SYSTEM RELIABILITY (Elective – V)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1805	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

I. Power System Reliability course is one of the important courses of the Electrical discipline.

II. 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.

UNIT-I GENERATING SYSTEM RELIABILITY ANALYSIS Classes:20

Generating System Reliability Analysis: Generation planning, 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 – 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

UNIT-II BULK POWER SYSTEM RELIABILITY EVALUATION Classes:15

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.

UNIT-III DISTRIBUTION SYSTEM RELIABILITY ANALYSIS – I Classes:15

Distribution System Reliability Analysis – I (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

UNIT-IV	DISTRIBUTION SYSTEM RELIABILITY ANALYSIS - II	Classes:15

Distribution System Reliability Analysis - II (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

1. Roy Billiton and Ronald N. Allan, "Reliability Evaluation of Power Systems", Plenum Press, New York and London, 2nd Edition, 1996.
2. 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

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4. https://www.audisankara.ac.in

E-Text Books

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2. https://www.freeengineeringbooks.com

Outcomes

CO1: Understand basic reliability concepts and reliability measures

CO2: Develop analytical models for power system reliability analysis

CO3: maintain the reliability of the system under unit outages

CO4: analyze reliability of distribution system under different abnormal conditions

CO5: create mathematical models for power system reliability analysis

CO6: assess the reliability of the modeled power system

AVAILABLE SELECTED MOOCs (ELECTIVE-V)

B.Tech 8th Semester: : Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16EE1810	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes: -	Tutorial Classes: -	Practical Classes: Nil				Total Classes: -		

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

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.

ENERGY AUDITING AND DEMAND SIDE MANAGEMENT
(Elective – VI)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1807	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil				Total Classes:65		

OBJECTIVES

I. This subject deals with the energy auditing, conservation, management techniques, measurements in energy audits. Information about how to improve the power factor & efficiency of electrical equipments.

II. To deals with DSM programme to improve financial performance and customer relations.

UNIT-I	INTRODUCTION AND BASIC PRINCIPLES OF ENERGY AUDIT: INTRODUCTION	Classes:15

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.

UNIT-II	ENERGY EFFICIENT MOTORS AND POWER FACTOR IMPROVEMENT	Classes:18

Energy Efficient Motors and Power Factor Improvement: Energy efficient motors , factors affecting efficiency, loss distribution , constructional details , characteristics - variable speed , variable duty cycle systems, RMS 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.

UNIT-III	Lighting , Energy Instruments and Economic Aspects	Classes:17

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.

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

UNIT-IV	DEMAND SIDE MANAGEMENT	Classes:15

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.researchgate.net
2. https://www.facstaff.bucknell.edu/
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4. https://www.audisankara.ac.in

E-Text Books

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Outcomes

CO1: Acquire the knowledge of fundamentals of energy auditing

CO2 :conduct energy audit and present the result

CO3 :select the energy efficient motors

CO4 :use different instruments for cost effective lighting

CO5 : determine the location and size of capacitor for power factor im provement

CO6 :understand different techniques in demand side management and create awareness on energy conservation

PRINCIPLES OF POWER QUALITY (Elective – VI)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1808	Core	3	1	-	3	40	60	100
Contact Classes:60	Tutorial Classes: 5	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. Determination of the optimal number and location of power quality analyzers to obtain given information level about the monitorized elec tric power system.

II. The principles of voltage sag transmission in this special type of power systems in order to evaluate, once the problem has been generated, the affected geographical area.

UNIT-I	BASICS OF POWER QUALITY AND STANDARDS	Classes:15

Basics of power quality and standards: Introduction and importance of Power Quality, symptoms of poor power quality. Various power quality issues such as transients, short duration voltage variations, long duration voltage variations, voltage imbalance, voltage fluctuations, voltage flicker and waveform distortion. Relevant power quality standards such as IEEE 1159- 2009 and IEEE 519- 2014. Grounding and power quality issues.

UNIT-II	Voltage sag	Classes:14

Voltage sag: Origin of voltage sags and interruptions, voltage sag characteristics- magnitude, duration, phase angle jump, point on wave initiation and recovery, missing voltage. Area of vulnerability, equipment behavior under voltage sag, ITIC curve, voltage sag monitoring and mitigation techniques

UNIT-III	TRANSIENT OVER VOLTAGES AND FLICKERS & FUNDAMENTALS OF HARMONICS	Classes:18

Transient Over Voltages and Flickers: Classification o f transients, sources of transient over voltages, computer tools for transient analysis, techniques for over voltage protection. Voltage flickers – sources of flickers, quantifying flickers and mitigation techniques.

Fundamentals of Harmonics: Harmonic distortion – voltage and current distortion, power system quantities under non sinusoidal condition – active, reactive and apparent power, power factor – displacement and true power factor, harmonic phase sequences and triplen harmonics, harmonic indices, sources of harmonics, effect of harmonic distortion

UNIT-IV	MEASURING AND CONTROL OF HARMONICS & MEASURING AND SOLVING POWER QUALITY PROBLEMS	Classes:18

Measuring and control of harmonics: Concept of point of common coupling and harmonic evaluation, principles of controlling harmonics, Harmonic study procedures and computer tools for harmonic analysis, Devices for controlling harmonic distortion design of filters for harmonic reduction.

Measuring and solving power quality problems: Introduction, power quality measurement devices – harmonic analyzer, transient disturbance analyzer, oscilloscopes, data loggers and chart recorders, true rms meters, power quality measurements, number of test location, test duration, instrument setup and guidelines

Text Books

1. J. Arrillaga, M. R. Watson, S. Chan, "Power System Quality Assess ment", John Wiley and Sons
2. M. H. J. Bollen, "Understanding Power Quality Problems, Voltage Sag and Interruptions", New York: IEEE Press, 2000, Series on Power Engineering.

Reference Books

1. Enriques Acha, Manuel Madrigal, "Power System Harmonics: Com puter Modeling & Analysis", John Wiley and Sons Ltd.
2. Ewald F. Fuchs, Mohammad A. S. Masoum, "Power Quality in Power Systems and Electrical Machines" Elsevier Publication.

Web References

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4. https://www.audisankara.ac.in

E-Text Books

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Outcomes

CO1 : Describe the various power quality phenomenon, their origin, monitoring and mitigation methods

CO2 : Analyze voltage sag problems and suggest preventive techniques

CO3 : Identify the harmonic sources and the effects of harmonics

CO4 : outline different protection schemes for voltage transients

CO5 : Understand the effects of various power quality problems in various equipment's

DESIGN OF ELECTRICAL SYSTEMS (Elective – VI)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1809	Core	3	1	-	3	40	60	100
Contact Classes:55	Tutorial Classes: 10	Practical Classes: Nil			Total Classes:65			

OBJECTIVES

I. This course presents a comprehensive coverage of Electrical Systems.

II. To Designing aspects of domestic and industrial installations, power factor and power quality improvement, resonance problems and economic aspects of system design.

UNIT-I	DESIGN ASPECTS AND ELECTRICAL INSTALLATIONS IN DOMESTIC BUILDINGS	Classes:15

Design Aspects and Electrical Installations in Domestic Buildings: Role of Statutes In Electrical System Design, Classification of Building Services, Design Aspects of Lighting, Design Aspects of Ventilation, Design Aspects of Climate Control, Design Aspects of Vertical Transportation, Design Aspects of Minor Building Services. Classification, Estimation of Load Requirements, Selection of Type Of Wiring, Special Features Applicable For High-Rise Apartment Buildings, Pre-Commissioning Tests.

UNIT-II	ELECTRICAL INSTALLATIONS	Classes:15

Electrical Installations: Classification of Industrial Installation, General Characteristics, Selection of Distribution Architecture, Selection of Transformers And Sub Stations Short Circuit Studies, Fault Current Calculations, Earthling Design, Selection of Switch Gears: Electrical Protection, Protection of Circuit Elements, Persons & Life Stack, Equipment, Electrical Isolation, Switch Gear Control, Switching Devices, Uses, Selective Co -ordination, Circuit Breakers and their Selection.

UNIT-III	POWER FACTOR IMPROVEMENT AND EARTHING & INTRODUCTION TO EARTHING	Classes:20

Power Factor Improvement and Earthing: Nature of Reactive Energy, Power Factor, Methods to Improve Power Factor, Economics of Power Factor Improvement, Location of Capacitors, Installation Precautions, Optimal Compensation, PF Correction of Induction Motors, Protection And Control, Voltage Transients, Switching Considerations.

Introduction to Earthing: Types of System Earthing, Reasons For Grounding/ Earthing, TN System, TT System, IT System, Protective Measures And Protective Devices In IT System, Main Characteristics of Earthing Systems, Selection Criteria For Earthing, Design Considerations of Earthing, Measurement of Earth Resistance, Earth Leakage Protection, Neutral Earthing For Generators And Transformers.

UNIT-IV	POWER QUALITY, RESONANCE PROBLEMS AND ENERGY ECONOMICS & INTRODUCTION TO ENERGY ECONOMICS	Classes:15

Power Quality, Resonance Problems And Energy Economics : In System Design: Power Quality Issues, Harmonics, Sources of Harmonics, Disturbances Caused By Harmonics, Methods To Reduce The Impact of Harmonics, Design The Detuned Capacitor Bank, filters, design aspects of filters, IEEE Standard 519-1992 And Limits.

Introduction to Energy Economics: Time Value of Money, Single Payment Compound Amount Model (SPCA), Uniform Series Compound Amount Model (USCA), Uniform Series Present Worth Model (USPW), Depreciation, Tax Considerations, after Tax Analysis,pay back period and net present value(NPV) .

Text Books

1. M. K. Giridharan "Electrical Systems Design", I. K. International Publishing House Pvt. Ltd.2011.
2. Er. V. K. Jain and Er. Amitabh Bajaj "Design of Electrical Installations", University Science Press. 1993.

Reference Books

1. V.K. Jain, Amitab Bajaj "A Text Book of Design of Electrical Installations", Lakshmi publications. New Delhi.
2. Hemant Joshi "Residential, Commercial and Industrial Electrical Systems: Equipment and Industrial Electrical systems", Tata McGraw-Hill.

Web Reference

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

CO1 : Understand the design Aspects of Electrical Installations for Do mestic as well as industrial Needs.

CO2 : Select the location and sizing of power factor improvement equipment's

CO3 : design earthing system for various installations

CO4 : Analyze the power quality problems and mitigate them by selecting suitable techniques

CO5: Understand the different methods used in Energy Economics of System Design.

CO6 : Gain knowledge on IEEE standards

AVAILABLE SELECTED MOOCs (Elective – VI)

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE1810	Core	3	1	-	3	40	60	100
Contact Classes: -	Tutorial Classes: -	Practical Classes: Nil				Total Classes: -		

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

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- 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.

MAJOR PROJECT AND COMPREHENSIVE VIVA – VOCE

B.Tech 8th Semester: Electrical & Electronics Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16EE2811	Core	-	-	8	12	60	140	200
Contact Classes: -	Tutorial Classes: -	Practical Classes: 75				Total Classes: 75		

Internal Evaluation for Major Project Work

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks out of which 60 marks for internal evaluation and 140 marks for semester end evaluation. Major project will be taken up batch wise and batches will be divided as per the guidelines. The object of major project is to enable the student to extend further the investigative study taken up as the project in Mini project 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).

Major Project 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 Major Project

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks. The Semester End Examination for major project work done during 8th 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 8th 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:

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 major project end examination.