ACADEMIC REGULATIONS, COURSE STRUCTURE, AND DETAILED SYLLABUS

ELECTRICAL AND ELECTRONICS ENGINEERING

For

B.Tech.FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2020-2021)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC- AUTONOMOUS)

Sponsored by TKR Educational Society, Approved by AICTE, Affiliated to JNTUH

Accredited by NAAC with 'A' Grade. Accredited by NBA

(Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097)

College

Vision:

Imparting Knowledge and instilling skills to the aspiring students in the field of Engineering, Technology, Science and Management to face the emerging challenges of the society.

Mission:

- Encouraging scholarly activities that transfer knowledge in the areas of Engineering, Technology, Science and Management.
- Ensuring students of all levels, well trained to meet the needs of education and their future endeavors.
- Inculcating human values and ethics into the education system for the all-round development of the students.

Department

About Department:

Department of Electrical & Electronics Engineering (EEE) (UG – PROGRAM) was established in the year 2005 with an intake of 60 and it is increased to 120 in the year 2012. The UG curriculum provides strong base to the students in Electrical and Electronics Engineering and provides exposure to the latest technologies. It emphasizes both the fundamentals of Physics (devices) and Mathematical (systems) sides of Electrical and Electronics Engineering as well as multi disciplinary nature of the field. The excellent infrastructure, teaching faculty of the best kind ensuring quality education such as interaction among students, parents and staff, along with a Training and Placement Cell ensures a bright future to its students. The department has conducted Workshops, Seminars, Guest lecture, Industrial & Field Visits, etc to update the Technical knowledge of students. Students are encouraged to actively participate in National-level technical meetings being organized at various engineering colleges. The department has fully equipped laboratories and facilities which are being used for training of undergraduate students.

Vision:

Imparting knowledge and Engineering skills to the aspiring students in the field of Electrical and Electronics Engineering, and to face the emerging challenges of the society.

Mission:

- Encouraging scholarly activities that transfer knowledge in the areas of Electrical and Electronics Engineering .
- Encourage the students and train them to meet the needs of education and their future endeavors.
- Inculcating human values and ethics into the education system for the all-round development of the students.

ACADEMIC REGULATIONS, COURSE STRUCTURE, AND DETAILED SYLLABUS

ELECTRICAL AND ELECTRONICS ENGINEERING

For

B.Tech.FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2020-2021)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC- AUTONOMOUS)

Sponsored by TKR Educational Society, Approved by AICTE, Affiliated to JNTUH

Accredited by NAAC with 'A' Grade. Accredited by NBA

(Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(Autonomous)

Accredited by NBA & NAAC with 'A' GRADE

1.0 Under-Graduate Degree Program in Engineering & Technology (UGP in E & T)

Teegala Krishna Reddy Engineering College (TKREC) offers a VIII- Semesters (4-years) Bachelor of Technology (B.Tech.) degree Program, under the Choice Based Credit System (CBCS) with effect from the academic year 2020- 21 in the various branches of Engineering.

2.0 Eligibility for Admission

2.1 Seats for each Program in the college are classified into CATEGORY-A (70% of intake), CATEGORY-B (30% of intake) and CATEGORY-C (10% of intake through Lateral Entry in III semester).

2.2 Admission to the CATEGORY-A (70% of Intake) is made either on the basis of the merit rank obtained by the qualified candidate in the entrance test conducted by the Telangana State Government (EAMCET) or on the basis of any other order of merit approved by the Talangana State council for Higher Education, subject to reservations prescribed by the government from time to time.

2.3 The college fills CATEGORY-B (30% of Intake) as per the guidelines of the competent authority.

2.4 CATEGORY-C (10% of intake) are Lateral Entry students who are admitted into the third semester directly based on the rank secured by the candidate in the Engineering Common Entrance Test (ECET) in accordance with the instructions received from the convener, ECET and the competent authority.

2.5 The medium of instruction for the entire under graduate Program in E & T will only be in English.

2.6 It is mandatory that every student follows the undertaking and abides by the rules of Teegala Krishna Reddy Engineering College.

3.0 B. Tech. Program structure

3.1 A student after securing admission is required to pursue the under graduate Program in B.Tech for a minimum period of eight semesters, (four academic years) and a maximum period of eight academic years starting from the date of commencement of the first semester, failing which the student shall forfeit the seat in the B.Tech course.

Each student should secure 160 credits (with CGPA ≥ 5.0) for the completion of Undergraduate Program and award of B.Tech. Degree.

B. Tech. Degree (LES)

The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years. The student shall register for 123 credits and secure 123 credits with CGPA ≥ 5 from II year to IV year B.Tech program (LES) for the award of B.Tech. degree. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech (LES).

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

3.2.1 **Semester scheme**

Each under graduate program constitutes eight semesters (four academic years). Each academic year is divided into two semesters, maximum of 22 weeks and minimum of 18 weeks (≥ 90 instructional days) each. In each semester, students are subjected to "Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE)". The Choice Based Semester System (CBSS) is implemented as prescribed by the UGC and the curriculum/course structure is followed as suggested by AICTE on time to time.

3.2.2 **Credit Courses**

All subjects/courses are to be registered by the student in a semester to earn credits which are assigned to each subject/course in an L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits) structure which is on the following general pattern.

- One credit for one Period/hour per week per semester for theory/lecture (L) courses.
- Half credit for one Period/hour per week per semester for laboratory/practical (P).

Courses like Environmental Science, Professional Ethics, Gender Sensitization lab, other social context courses, CRT and student activities like NCC/NSO, NSS are identified as mandatory courses. These courses do not carry any credits.

3.2.3 The structure of the Under Graduate Engineering Program:

S.NO.	CATEGORY	Suggested breakup of credits (Total 160)
01	Humanities and Social sciences including Management	9*
02	Basic Sciences	25*
03	Engineering Sciences courses including Workshop, Drawing,basics of Electrical/Mechanical/Computer etc.	18*
04	Professional Core Courses	66*
05	Professional Elective Courses relevant to chosenspecialization/branch	18*
06	Open Electives-Electives from other technical and/oremerging subjects	9*
07	Project work, Seminar and Internship in Industry orelsewhere	15*
08	Mandatory courses [Environmental Sciences, Induction Training, Indian Constitution, Essence of Indian Traditional Knowledge]	(non- credit)
	Total	**160***

***Variation is allowed as per the need of the respective disciplines.**

3.2.4 Subject Code Classification

The subject codes of various branches in TKREC Regulations are formulated using the following Procedure

Regulation, Branch, Semester, Classification, S.No.

Regulation	**20,21, 22, …., and so on**
UG Branch	**Corresponding branch code like CE,EE …..etc**
Semester	**I,II,III,IV,V,VI,VII,VIII**
Classification	**HS-Humanities and Sciences, BS-Basic Sciences,ES-Engineering Sciences, PC- Professional Core,PE-Professional Elective, OE-Open Elective, PW-Project Work**
S.No.	**1 to 9**

4.0 Course registration

4.1 An adviser /counselor or mentor from the faculty shall be assigned to a group of 20 students, who instructs the students regarding the Under Graduate Program, its course structure and curriculum, choice/option for subjects/courses, which is based on their competence, progress, pre-requisites and interest.

4.2 The academic section of the college invites 'registration forms' from students before the commencement of the semester through 'on-line registration' ensuring 'date and time stamping'. The on-line registration requests for any 'current semester' shall be completed before the commencement of the SEEs (Semester End Examinations) of the 'preceding semester', and for 1st semester students the online registration requests shall be completed four weeks from the date of admission.

4.3 A student can apply for on-line registration, only after obtaining the written approval from the faculty adviser/counselor or mentor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, faculty advisor/counselor or mentor and the student.

4.4 A student should register for all the courses offered to him in that particular semester not exceeding nine subjects/courses, excluding the Mandatory Courses.

4.5 If the student submits ambiguous choices or multiple options during on-line registration for the subject /course under a given/specified course group/category as listed in the course structure, then the Head of the Department will allot a subject/course without considering the submission.

4.6 Subject/course options exercised through on-line registration are final and cannot be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject/course that has already been listed for registration by the Head of the Department in a semester cannot be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to select an alternate choice either for a new subject (subject to offering of such subject), or another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and within a time-framed schedule, in the first week after commencement of the class-work for that semester.

4.7 Open electives: The students have to choose three/four open electives (OE-I), (OE-II) (OE- III), (OE-IV) depending upon the curriculum. The student cannot opt for open elective subjects offered by their own (parent) department. The student can choose an open elective subject from the list of subjects offered by any other department of the same college. Once, a subject is chosen under the open elective category it cannot be opted again.

4.8 Professional electives: Students have to choose six professional electives (PE-I, PE-II, PE-III, PE-IV, PE-V, PE-VI). However, the students may opt for professional elective subjects offered in the related area.

5.0 Subjects/courses to be offered

5.1 The class strength for each semester shall be 60.

5.2 A subject/ course may be offered to the students, only if a minimum of 20 students (1/3 of the section strength) opt for it. The maximum strength of a section is limited to 80 (60+ 1/3 of the

strength of the section).

5.3 More than one faculty member may offer the same subject (lab/practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice by the students will be based on – 'first come first serve basis and the CGPA criterion' (i.e. the primary shall be on on-line entry from the student for registration in that semester, and the focus that follows, if needed, will be on the CGPA of the student)

5.4 If more entries for registration of a subject comes into picture, then the concerned Head of the Department shall decide, whether or not to offer such a subject/ course for two (or multiple) sections.

5.5 An Elective Course is offered to the students if and only if there is a minimum of 1/3 strength of the sanctioned intake registers for that course.

6.0 Attendance requirements

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate in all the subjects/courses including days of internal examinations (excluding attendance in mandatory courses like Environmental Science, Professional Ethics, Gender Sensitization Lab, NCC and NSS, subjects related to social context and CRT) for that semester.

6.2 For Mandatory Courses a 'Satisfactory Participation' report shall be issued to those students from the authorities concerned only after securing ≥ 65% attendance in such a course.

6.3 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on valid grounds, like natural calamity, medical emergency, any sudden demise of close family members based on the students representation with supporting evidence/certificates.

6.4 A stipulated fee shall be paid to condone the shortage of attendance.

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

6.6 Students whose shortage of attendance, is not condoned in a semester, are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall be cancelled. They will not be promoted to the next semester.

6.7 The students who are detained due to lack of attendance should seek re-admission into that semester as and when offered, and re-register all the courses offered in that semester.

6.8 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class, until completion of the VIII semester, even on payment of the requisite fees.

7.0 Academic requirements

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

7.1 A student shall be deemed to have satisfied the minimum academic requirements if he/she has earned the credits allotted to each subject/course, and has secured not less than 35% marks (26 out of 75) in the semester end examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together in terms of letter grades. This implies securing 'C' grade or above in that subject/course

7.2 Promotion Rules:

S.No.	Promotion	Conditions to be fulfilled
1.	**I Semester to II Semester**	**Regular course of study of I semester bysatisfying attendance requirements.**

2.	**II Semester to III Semester**	**Regular course of study of II Semester, by satisfying attendance requirements. Must have secured at least 50% credits up to from the offered credits from all the relevant regular and supplementaryexaminations, whether the student takes those examinations or not.**
3.	**III Semester to IV Semester**	**Regular course of study of III semester, bysatisfying attendance requirements.**
4.	**IV Semester to V Semester**	**Regular course of study of IV semester, bysatisfying attendance requirements, andmust have secured at least credits i.e., 60%credits up to IV semester from the offeredcredits (rounding to near low value) from all the relevant regular and supplementary examinations, whether the students takes those examinations or not**
5.	**V Semester to VI Semester**	**Regular course of study of V Semester, bySatisfying attendance requirements.**
6	**VI Semester to VII Semester**	**Regular course study of VI semester, by satisfying attendance requirements. Must have secured at least 60% credits (rounding to near lower value) up to VI Semester from the offeredcredits from all the relevant regular andsupplementary examinations, whether the student takes those examinations or not.**
7	**VII Semester to VIII Semester**	**Regular course of study of VII Semester, bysatisfying attendance requirements.**

Promotion Rules for Lateral Entry Students

S.No.	Promotion	Conditions to be fulfilled
01	**III Semester to IV Semester**	**Regular course of study of Second Year first semester, by satisfying attendance requirements.**
02	**IV Semester to V Semester**	**Regular course of study of IV Semester by satisfying attendance requirements and a minimum of 50 % of credits (rounding to thenear lower value) from the offered credits, from one regular and one supplementary examinations of III semester, irrespective of the candidate takes the examination or not.**
03	**V Semester to VI Semester**	**Regular course of study of V Semester bysatisfying attendance requirements.**
04	**VI semester to VII Semester**	**Regular course of study of VI Semester bysatisfying academic requirements and aminimum of 60% of credits (rounding to thenear low value) from the offered credits,from two regular and two supplementaryexaminations of III Semester; two regularand one supplementary examinations of IV Semester; one regular and one Supplementary examination of V Semester.**
05	**VII Semester to VIII Semester**	**Regular course of study of VII semester bysatisfying the academic requirements.**

7.3 A student shall register for subjects covering 160 credits as specified and listed in the course

structure, fulfill all the attendance and academic requirements for 160 credits, 'earn all 160 credits' by securing SGPA ≥ 5.0 (in each semester) and CGPA (at the end of each successive semester ≥ 5.0) to successfully complete the Under Graduate Program.

7.4 A student eligible to appear in the end semester examination for any subject/course, but absent from it or failed (there by failing to secure 'c' grade or above) may reappear for that subject/course in the supplementary examination as and when conducted. In such cases, the CIE assessed earlier for that subject/course will be carried over, and added to the marks to be obtained in the SEE Supplementary examination for evaluating the performance in that subject.

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

7.6 A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits.** The academic regulations under which the student has been re-admitted shall be applicable to him.

8.0 Evaluation – Distribution and Weightage of marks

8.1 The performance of a student in every subject/course (including Practical) will be evaluated for 100 marks each, with 25 marks allotted for CIE (Continuous Internal Evaluation) and 75 marks for SEE (Semester End Examination).

8.2 For theory subjects, during a semester there shall be two mid-term examinations and average of two internal examinations will be taken as the final marks for CIE. Each mid-term examination consists of only descriptive paper carrying 20 marks with the time duration of 1hour 20 minutes. The remaining 5 marks will be evaluated by the assignment given by the concerned faculty. The syllabus for the first mid examination shall be first 2.5 units. The second mid examination covers remaining 2.5 units of syllabus. **The total marks secured by the student for the whole CIE (Continuous Internal Evaluation) will be the average of two mid-terms.** If any student is absent from / would like to seek improvement in any subject of a mid- term examination, a computer based test will be conducted for him/her by the examination branch of the college, which will be scheduled after completion of both mid-term examinations.

The details of CIE exam question paper are as follows

- ❖ The pattern of Mid-term exam for CIE consists of 4 questions and no choice will be given.
- ❖ Each question carries 5 marks.
- ❖ There will be a CBT (Computer Based Test) for the students who are absent and secured less than 14 marks in the continuous internal evaluation. The CBT will be conducted before the announcement of the results of semester-end exams.
- ❖ The question bank for the CBT should cover entire syllabus of the corresponding course.

The details of the pattern of the end semester question paper are as follows

- ➢ The end semester examinations will be conducted for 75 marks.
- ➢ The question paper consists of two parts namely Part- A and Part-B.
- ➢ Part-A consists of 10 questions. Each question carries 2.5 marks each and no choice will be given. Two questions are from one unit and all the five units should be covered.
- ➢ Part-B consists of five questions (number from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub questions. For each question, there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

The details of evaluation of end semester exam are as follows

- Double evaluation of the answer scripts is followed.
- The average of the two evaluations shall be considered as final marks.
- If the difference of two valuations is more than or equal to15 marks, third evaluation shall be recommended.
- If any difference appeared in the marks after the third valuation also, average of two evaluations will be considered whose difference is minimum, as final marks.

The details of challenging valuation of end semester exam are as follows

- There shall not be any recounting or re-evaluation for all subjects as the double valuation was adopted. But, the students will be given a chance to apply for challenging valuation for all the theory Subjects (no Practical/lab subjects) within one week from the date of declaration of results.
- Whenever the students apply for challenge valuation of answer scripts of semester end examinations, the students should submit their applications (through the HOD) within one week from the date of declaration of the results to the Examination Branch by paying Rs.10,000 (Rupees Ten Thousand only) per subject, in the form of Demand Draft, Drawn in Favor of "TKREC AUTONOMOUS". Any application received after the due date of submission for Challenge valuation, shall not be accepted under any circumstances.

On receipt of the DD

The answer script of the applied subject will be shown to the candidate to verify whether it belongs to him or not and the script will be evaluated by the senior faculty of the college appointed by the Controller of examinations. If there is any change in marks (Equal or above 15% of the maximum marks) the new marks will be awarded to the student. Otherwise, there will be no change in old marks. If the change in marks (Equal or above 15% of the maximum marks) occurs, an amount of Rs.9,000/- will be refunded to the student. Otherwise, the student will forfeit the total amount which he/she paid.

8.3 For practical subjects there shall be a continuous internal evaluation during the semester for 25 marks and 75 marks for end semester practical examinations. The duration for both Internal and External Practical Examination is 3 hours. For 25 marks of Internal Evaluation of practical subjects, day-to-day evaluation in laboratory is done for 15 marks and internal practical examination will be assessed for 10 marks. The concerned laboratory subject teacher (Internal Examiner) will conduct the internal practical examination only. The external practical examination will have 2 examiners, one is the external examiner and the other is the internal examiner. The controller of examinations of the college will appoint the external examiner with the consultation of the chief superintendent of examinations from the three names given by the concerned department.

8.4 For the subjects that include design and/or drawing, (such as engineering graphics, engineering drawing, machine drawing and estimation), the distribution shall be 25 marks for continuous internal evaluation (15 marks for day-to-day evaluation and 10 marks for internal examination) and 75 marks for semester end examination. **There shall be two internal examinations in a semester and the average of the two shall be considered for the award of marks for internal examinations**.

8.5 (i) For subjects like **Engineering Graphics/ Engineering Drawing**, the SEE shall consist of five questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

(ii) For the Subject **Estimation, Costing and Project Management**, the SEE paper should consist of Part- A, Part-B and Part C. (i) Part – A, 1 out of 2 questions from Unit – I for 30 Marks, (ii) Part – B, 1 out of 2 questions from Unit – II for 15 Marks,(iii) Part – C, 3 out of 5 questions from Units – III, IV, V for 30 Marks.

(iii) For subjects **Structural Engineering – I & II (RCC & STEEL),** the SEE will be conducted for 75 marks consisting of 2 parts viz. (i) Part – A for 15 marks and, (i) Part – B for 60 marks. Part

– A is a compulsory question consisting of ten sub- questions. The first five sub-questions are from each unit relating to design theory and codal provisions and carry 2 marks each. The next five sub-questions are from each unit and carry 1 mark each. Part – B consists of 5 questions (numbered 2 to 6).

8.6 The student has to undergo a comprehensive MCQ TEST/ Seminar/Internship/industry oriented mini project/Project Work offered to him by their respective departments and subsequently should satisfy the requirements for completion to acquire the required credits.

8.7 There shall be an Internship in collaboration with an industry of their specialization. Students will register for this immediately after II year II semester examinations and pursue it during summer vacation for 15 days. The Internship shall be submitted in a report form and presented before the committee in III year I semester. It shall be evaluated for 100 internal marks. The committee consists of Head of the Department, supervisor of the Internship and a senior faculty member of the department.

8.8 There shall be an Industrial Oriented Mini Project in collaboration with an industry of their specialization. Students will register for this immediately after III year II semester examinations and pursue it during summer vacation for one month. Industrial Oriented Mini Project shall be submitted in a report form and presented before the committee in IV year I semester. It shall be evaluated for 100 external marks. The committee consists of an external examiner, Head of the Department, supervisor of the Industrial Oriented mini project and a senior faculty member of the department. There shall be no internal marks for Industrial Oriented Mini Project.

8.9 There shall be a seminar presentation in IV year I semester. For the seminar, the student shall collect the information on a specialized topic, prepare a technical report, and submit it to the department. It shall be evaluated by the departmental committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 100 internal marks. There shall be no semester end examination for the seminar.

8.10 There shall be a comprehensive MCQ exam in IV year I semester. For the comprehensive MCQ exam covers the core subjects which are related to Graduate Aptitude Test in Engineering. It shall be evaluated by the departmental coordinator nominated by Head of the Department. The comprehensive MCQ exam shall be evaluated for 100 internal marks and consists of 50 MCQs. The student has to secure 40% of 100 marks i.e.40 marks. If any student is absent or failed in the comprehensive MCQ exam then he/she can appear for next supplementary exam like other end semester examinations.

8.11 UG project work shall be carried out in two stages: Project Stage – I during IV Year I Semester, Project Stage – II during IV Year II Semester. Each stage will be evaluated for 100 marks. Student has to submit project work report at the end of each semester. First report includes project work carried out in IV Year I semester and second report includes project work carried out in IV Year I & II Semesters. SEE for both project stages shall be completed before the commencement of SEE Theory examinations.

(i) For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall evaluate the project work for 75 marks and project supervisor shall evaluate for 25 marks. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together. A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such 'one re-appearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

(ii) For Project Stage – II, the external examiner shall evaluate the project work for 75 marks and the project supervisor shall evaluate it for 25 marks. The topics for industrial oriented mini project, seminar and Project Stage – I shall be different from one another. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum '

total of the CIE and SEE taken together. For conducting viva-voce of project stage – II, the controller of examination will nominate an external examiner with the consultation of the chief superintendent from the list of experts in the relevant branch submitted by the concerned department. A student who has failed may re-appear once for the above evaluation in the current semester, when it is scheduled again; if student fails in such 'one re-appearance' evaluation also, he/she has to reappear for the same in the next subsequent semester, as and when it is scheduled.

(iii) Procedure for opting the MOOCs

- If any student got an opportunity to do the final year project as an internship in any reputed company (Approved by the departmental committee), the student can opt for MOOCs which are equivalent to the elective courses offered in VIII semester.
- The MOOCs should be approved by the concerned BOS.
- The selected MOOCs duration should be minimum of 12 weeks.
- A student is eligible to secure up to 12 credits only through MOOCs.

8.12 The laboratory marks, sessional marks, and the end examination marks awarded by the college are subject to scrutiny and scaling, if necessary, by a committee, constituted in this regard, with a university representative/under the guidance of the Director of Evaluation of the affiliating university. The recommendations of the committee are final and binding. The laboratory records, internal examination scripts and external examination scripts, shall be preserved as per the rules for two consecutive academic years if the respective subjects are cleared, and shall be produced before the committee as and when required, till preserved.

8.13 For mandatory courses related to Environmental Science, Constitution of India, Intellectual Property Rights, Gender Sensitization lab and Campus recruitment training a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course. **These marks should also be uploaded along with the internal marks of other subjects**

8.14 For all non-credit courses and mandatory courses, no marks or letter grade is allotted.

9.0 Grading Procedure

9.1 Marks will be awarded to the student to indicate the performance in each theory subject, laboratory/ practical's, seminar, project stage I and project stage II. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item no. 8 above, a corresponding letter grade shall be given.

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

% of marks secured in a subject/course	Letter Grade	GradePoints
90% to 100%	O (Outstanding)	10
80 and less than 90%	A^+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B^+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (Fail)	0
Absent	Ab	0

**** Awarding of Letter Grade will be done for the benefit of the student.**

9.3 A student obtaining '**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 same as those obtained earlier.

9.4 A student who has not appeared for an examination in any subject '**Ab'** grade will be allocated in that subject, and the student shall be considered as **'failed'.** The student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered.

9.5 A letter grade will not indicate any specific percentage of marks, but states only the range of marks he/she has obtained.

9.6 A student earns Grade Point (GP) in each subject/course, based on the Grade Point the letter grade is awarded for 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 points (GP) x Credits for a course

9.7 The student passes the subject/course only when **GP ≥ 5 ('C' grade or above).**

9.8 The semester grade point average (SGPA) is calculated by dividing the sum of credit points (∑CP) secured from all subjects/course registered in a semester, by the total number of credits registered during the semester. SGPA is rounded off to two decimal places. SGPA is thus calculated as

SGPA = {∑*N*i=1*CiGi*}/ {∑*N* *Ci*} ….. For each semester,

where 'i' is the subject indicator index (takes into account all subjects, in a semester), 'N' is the no. of subjects registered for the semester (as specifically required and listed under the course structure of the parent department), Ci is the no. of credits allotted to the ith subject, and Gi represents the grade points (GP) corresponding to the letter grade awarded for the ith subject.

9.9 The cumulative grade point average (CGPA) is a measure of the overall cumulative performance of a student in **all semesters** considered for registration. The CGPA is the ratio of the total credit points secured by a student in all registered courses in all semesters, and the total number of credits registered in all the semesters. CGPA is rounded to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

CGPA = {∑Mj=1*CjGj*}/ {∑Mj=1 C j for all semester registered}

(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M'** is the **total no. of subjects** (as specifically required and listed under the course structure of the parent department) the student has '**registered**' i.e., from 1st semester onwards up to and inclusive of the 8th semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), cj is the no. of credits allotted to the jth subject, and Gj represents the grade point (GP) corresponding to the letter grade awarded for that jth subject. After registration and completion of first year first semester, the SGPA of that semester itself can be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course/subject	Credits	Grade points	Letter Grade	Credit Points
Course1	3	8	A	3 x 8 = 24
Course2	3	10	O	3 x 10 = 30
Course3	3	5	C	3 x 5 = 15
Course4	3	6	B	3 x 6 = 18
Course5	3	9	A+	3 x 9 = 27
Course6	1.5	7	B+	1.5x 7 = 10.5
	16.5			**124.5**

SGPA = 124.5/16.5 = 7.55

Illustration of calculation of CGPA up to 2nd Semester

Course/subject	Credits	LetterGrade	Gradepoints	Credit Points
I year I semester				
Course1	4	A	8	4 x 8 = 32
Course2	4	O	10	4 x 10 = 40
Course3	4	C	5	4 x 5 = 20
Course4	3	B	6	3 x 6 = 18
Course5	3	A+	9	3 x 9 = 27
Course6	3	B+	7	3 x 7 = 21
I year II semester				
Course7	4	B	6	4 x 7 = 28
Course8	4	O	10	4 x 10 = 40
Course9	4	C	5	4 x 5 = 20
Course10	3	B	6	3 x 6 = 18
Course11	3	A+	9	3 x 9 = 27
Course12	1.5	B+	7	1.5 x 7 = 10.5
Total Credits =	**40.5**		**Total Credit=**	**301.5**

CGPA = 301.5/40.5 = 7.44

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

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

9.11 For calculations listed in regulations 9.6 to 9.9, performance in failed subjects/courses (securing **F grade**) will also be taken into account, and the credits of such subjects/courses will be included in the multiplications and summations. After passing the failed subjects (s), newly secured grade points will be taken into account for calculation of SGPA and CGPA. However, mandatory courses will not be taken into consideration for calculation of CGPA and SGPA.

10.0 Passing standards

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

10.2 After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (Course code, title, no. of credits, and grade earned etc.), credits earned, SGPA, and CGPA.

11.0 Declaration of results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

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

% of marks = (CGPA-0.5) x 10

12 Award of degree

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

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3 Students with the final CGPA (at the end of the under graduate Program) ≥ 8.00, and fulfilling the following condition will be awarded **'first class with distinction'; should have secured a final (at the end of the undergraduate Program) CGPA ≥ 8.00,** for each year of course study.
Students with final CGPA (at the end of the under graduate Program) ≥ **6.50 but <8.00**, shall be placed in '**first class'**.
Students with final CGPA (at the end of the under graduate Program) ≥ **5.50 but<6.50**, shall be placed in '**second class'**.
Students with final CGPA (at the end of the under graduate Program) ≥ **5.00 but <5.50,** and all other students who qualify for the award of degree (as per 12.1) with final CGPA ≥ **5.00 but <5.50**, shall be placed in **'pass class'**.
A student with final CGPA (at the end of the under graduate Program) **<5.00, will not be eligible** for the award of the degree**.**

12.4 Student who secures SGPA ≥ 8.00 consistently in all semesters will be eligible to compete for the awards of 'rank' and 'gold medal'.

13 Withholding of results

13.1 If the student has not paid the fees to the college at any stage, has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and student will not be allowed to go into the next semester. The award or issue of the degree may also be withheld in such cases.

14.0 Transitory Regulations

14.1 A student, who has discontinued for any reason, is liable to completely pay his balance annual fees, up to discontinued year.

14.2 A student who is detained due to lack of credits or lack of attendance has to follow the existing regulations of the year in which he/she is re-admitted, with additional/substitute subjects if necessary.

15.0 Students Transfers

15.1 There shall be no branch transfers after the completion of the admission process.

15.2 There shall be no transfers from one branch to another branch within the constituent colleges and units of the affiliating university (JNTUH).

15.3 The students seeking transfer under the ceiling admission category to this college from any of the JNTUH affiliated Autonomous colleges or from various other Universities/institutions (National Importance, Autonomous) have to pass the failed subjects which are equivalent to the subjects of Teegala Krishna Reddy Engineering College and also pass the subjects of Teegala Krishna Reddy Engineering College which the students have not studied at the earlier institution/university. Further, though the students have passed some of the subjects at the earlier institution/university, if the same subjects are being offered in different semesters of Teegala Krishna Reddy Engineering College, the students have to study those subjects in Teegala Krishna Reddy Engineering College

in spite of the fact that those subjects are repeated.

15.4 The students transferred from other Universities/institutions to Teegala Krishna Reddy Engineering College, shall be provided a chance of writing online internal examination **for the failed subjects/and or subjects not studied** as per the equivalences recommended in the clearance letter issued by the university/institution, at the end of the semester as per the prescribed schedule by the college examination cell.

16.0 Scope

16.1 The academic regulations should be read as whole, for the purpose of any interpretation.

16.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, Governing Body of Teegala Krishna Reddy Engineering College is final.

16.3 The college may change or amend the academic regulations, course structure or syllabi, at any time, and the changes or amendments made shall be applicable to all students with effect from the date of notification by the college authorities.

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/ Improper conduct	**Punishment**
	If the Student	
1. (a)	Possesses or carries accessible in the 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 (materialshall include any marks on the body of the candidate which can be used as an aid in thesubject of the examination)	Expulsion fromthe examination hall and cancellationof the performance in that subject only.
(b)	Gives assistance or guidance or receives it fromany other candidate orally or byany other bodylanguage methods or communicates through cell phones with any candidate or persons in oroutside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellationof the performance in that subject only of all the candidates involved. In case of an outsider, he will behanded 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 cancellationof the performance in that subject and all other subjects the candidate has already appeared includingpractical examinations and project work and shall notbe permitted to appear for the remaining examinationsof the subjects of that Semester. The hall ticket of the candidate should be cancelled.
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from the 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 practical and project work) already appeared and shall not be allowed to appear for

		examinations of the remaining subjects of that semester. The student is also debarred for two consecutive semesters from class work and all end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of the seat. If the imposteris an outsider, he will be handed over to the police and a case will be 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 cancellationof performance in that subject and all the other subjects the candidate has already appeared includingpractical examinations and project work and shall notbe permitted for the remaining examinations of the subjects of that semester. The student is also debarred for two consecutive semesters from class work and all end examinations. The continuation of the course by the student is subject to the academicregulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters tothe examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk-out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury tohis person or to any of his relations whether	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 shallnot be permitted to appear for the remaining examinations of the subjects of that semester. 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 will be registered against them.
	by words, either spoken or written or by signsor by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has thetendency to disrupt the orderly conduct of the examination	
7.	Leaves the exam hall taking away answerscript 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 inthat subject and all the other subjectsthe candidate has already appeared including practicalexaminations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all end examinations. The continuation of thecourse by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation ofthe performance inthat subject and all other subjectsthe 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. The candidate is also debarred and forfeits the seat.

9.	Indulges in any malpractice or improperconduct mentioned in clause 6 to 8 and is not a student for the particular examination or not a person connected with the college.	Student of the college expulsion from the examinationhall and cancellation ofthe Performance inthat 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. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation ofthe performance inthat subject and all other subjectsthe 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.
11.	Is detected copying on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and allother subjects the candidate has appeared including practical examinations and project work of that semester examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall bereported to the PRINCIPAL / DIRECTOR forfurther action to award suitable punishment.	

I Year B.Tech. EEE - I Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
01	20MA1BS01	BS	Mathematics-I	3	1	0	4
02	20CH1BS02	BS	Chemistry	3	1	0	4
03	20EE1ES01	ES	Basic Electrical Engineering	3	0	0	3
04	20ME1ES05	ES	Engineering Workshop	1	0	3	2.5
05	20EN1HS01	HS	English	2	0	0	2
06	20CH1BS03	BS	Engineering Chemistry Lab	0	0	3	1.5
07	20EN1HS02	HS	English Language and Communication Skills Lab	0	0	2	1
08	20EE1ES03	ES	Basic Electrical Engineering Lab	0	0	1	1
09			Induction Programmer				
	Total			**12**	**2**	10	19

I Year B.Tech. EEE - II Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
01	20MA2BS04	BS	Mathematic-II	3	1	0	4
02	20AP2BS05	BS	Applied Physics	3	1	0	4
03	20CS2ES04	ES	Programming for Problem Solving	3	1	0	4
04	20ME2ES02	ES	Engineering Graphics	1	0	4	3
05	20AP2BS06	BS	Applied Physics Lab	0	0	3	1.5
06	20CS2ES06	ES	Programming for Problem Solving Lab	0	0	3	1.5
07	20MC2ES07	MC	Environmental Science	3	0	0	0
	Total			**13**	**3**	**10**	**18**

II Year B.Tech. EEE - I Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
01	20EE3PC01	PC	Analog electronics	3	0	0	3
02	20EE3PC02	PC	Electrical circuit analysis	3	1	0	4
03	20EE3PC03	PC	Electrical machines -1	3	1	0	4
04	20EE3PC04	PC	Electromagnetic fields	3	1	0	4
05	20EE3ES08	ES	Engineering mechanics	3	0	0	3
06	20EE3PC05	PC	Analog electronics lab	0	0	2	1
07	20EE3PC06	PC	Electrical circuits lab	0	0	2	1
08	20EE3PC07	PC	Electrical machines lab-1	0	0	2	1
09	20MC3HS01	MC	Professional &Engineering Ethics	2	0	0	0
10	20MC3BS02	MC	Quantitative Analysis - 1	2	0	0	0
	Total			**19**	**3**	**6**	**21**

II Year B.Tech. EEE - II Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
01	20EE4PC01	PC	Power Electronics	3	1	0	4
02	20EE4PC02	PC	Digital electronics	3	0	0	3
03	20EE4PC03	PC	Electrical machines -II	3	1	0	4
04	20EE4BS07	BS	Numerical Methods & Complex Variables	3	1	0	4
05	20EE4PC05	PC	Power system-I	3	0	0	3
06	20EE4PC06	PC	Power Electronics lab	0	0	2	1
07	20EE4PC07	PC	Digital electronics lab	0	0	2	1
08	20EE4PC08	PC	Electrical machines lab -II	0	0	2	1
09	20MC4HS03	MC	Gender Sensitization Lab	0	0	2	0
10	20MC4HS10	MC	Quantitative Logical and Reasoning	2	0	0	0
	Total			**17**	**3**	**8**	**21**

III Year B.Tech. EEE - I Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
01	20EE5PC01	PC	Control Systems	3	1	0	4
02	20EE5PC02	PC	Power system II	3	0	0	3
03	20EE5PC03	PC	Measurements and Instrumentation	3	0	0	3
04	20MS5HS03	MS	Business Economics and financial analysis	3	0	0	3
05		PE	Professional Elective -1	3	0	0	3
06	20EN5HS04	HS	Advanced communication skills lab	0	0	2	1
07	20EE5PC06	PC	Measurements and Instruments lab	0	0	2	1
08	20EE5PC07	PC	Control Systems lab	0	0	2	1
09	20EE5PC08	PC	Power system simulation lab	0	0	2	1
10	20MC5HS05	MC	Intellectual property Rights	3	0	0	0
11	20MC5HS06	MC	Personality Development Soft skills	2	0	0	0
12	20EE5PW01	PC	Summer Internship	0	0	0	1
	Total			**20**	**3**	**8**	**21**

Professional Elective – I

S. No	Subject Code	Subject Name
1	20EE5PE11	Modern Power Electronics
2	20EE5PE12	High Voltage Engineering
3	20EE5PE13	Electrical Machine Design
4	20EE5PE14	Internet of Things

III Year B.Tech. EEE - II Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
1	20EE6PC01	PC	Power system operation and control	3	0	0	3
2	20EE6PC02	PC	Microprocessor and Microcontrollers	3	0	0	3
3	20EE6PC03	PC	Power system protection	3	0	0	3
4	20EE6PC04	PC	Power Semiconductor Drives	3	0	0	3
5		OE	**Open Elective-1**	3	0	0	3
6		PE	**Professional Elective - II**	3	0	0	3
7	20EE6PC05	PC	Microprocessor and Microcontrollers lab	0	0	2	1
8	20EE6PC06	PC	Power system lab	0	0	2	1
9	20EE6PC07	PC	Electrical Workshop lab	0	0	2	1
10	20EE6HS08	HS	Basic Technical Training (BTT)	3	0	0	0
	Total			**21**	**0**	**6**	**21**

Professional Elective – II

S. No	Subject Code	Subject Name
1	20EE6PE21	Smart Grid Technologies
2	20EE6PE22	Renewable energy sources
3	20EE6PE23	Special Machines
4	20EE6PE24	Computer Organization

Open Elective–I

S. No	Subject Code	Subject Name
01	20EE6OE11	Renewable energy sources
02	20EE6OE12	Electrical Engineering materials

***Open Elective subjects' syllabus is provided at the end of the document.**

***Open Elective – Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.**

Ex: - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.

IV Year B.Tech. EEE - I Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
1		OE	Open Elective -II	3	0	0	3
2		PE	Professional Elective -III	3	0	0	3
3		PE	Professional Elective-IV	3	0	0	3
4	20EE7MS01	MS	Fundamentals of Management for Engineers	3	0	0	3

5	20EE7PC02	PC	Power Qualityand Facts	3	0	0	3
6	20EE7PC03	PC	Electrical System Simulation Lab	0	0	3	1
7	20EE7PC04	PC	Industrial Oriented Mini Project	0	0	4	2
8	20EE7PC05	PC	Seminar	0	0	2	1
9	20EE7PC06	PC	Comprehensive test	0	0	0	1
10	20EE7PC07	PC	Project Stage - I	0	0	6	3
11	20EE7 HS 08	HS	Advance Technical Training (ATT)	3	0	0	0
	Total			**18**	**0**	**15**	**23**

Professional Elective – III

S. No	Subject Code	Subject Name
1	20EE7PE11	Switched mode power conversion
2	20EE7PE12	Utilization of Electrical Power
3	20EE7PE13	Digital Control Systems
4	20EE7PE14	Embedded Systems

Professional Elective – IV

S. No	Subject Code	Subject Name
01	20EE7PE21	Electrical and Hybrid Vehicles
02	20EE7PE22	Optimization Techniques
03	20EE7PE23	Industrial Electrical systems
04	20EE7PE24	VLSI Design

Open Elective–II

S. No	Subject Code	Subject Name
01	20EE7OE21	Design of Electrical Systems
02	20EE7OE22	Energy Storage Systems

***Open Elective subjects' syllabus is provided at the end of the document.**
***Open Elective – Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.**

Ex: - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.
IV Year B.Tech.EEE - II Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
1		OE	Open Elective-III	3	0	0	3
2		PE	Professional Elective -V	3	0	0	3
3		PE	Professional Elective -VI	3	0	0	3
4	20EE8PC01	PC	Project Stage - II	0	0	14	7

	Total	**9**	**0**	**14**	**16**

Professional Elective– V

S. No	Subject Code	Subject Name
1	20EE8PE11	HVDC Transmission
2	20EE8PE12	Deregulated Power System
3	20EE8PE13	AI Techniques in Electrical Engineering
4	20EE8PE14	Signals and Systems

Professional Elective – VI

S. No	Subject Code	Subject Name
1	20EE8PE21	Advanced Electric Drives
2	20EE8PE22	Electrical Distribution Systems
3	20EE8PE23	Control Systems Design
4	20EE8PE24	Digital Signal Processing

Open Elective–III

S. No	Subject Code	Subject Name
01	20EE8OE31	Utilization of Electrical Energy
02	20EE8OE32	Energy conservation and Audit

***Open Elective subjects' syllabus is provided at the end of the document.**
***Open Elective – Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.**

Ex: - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE - I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20MA1BS01) MATHEMATICS – I

Course Objectives: To learn.

1 Types of matrices and their properties.
2 Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
3 Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
4 Concept of Sequence.
5 Concept of nature of the series
6 Geometrical approach to the mean value theorems and their application to the mathematical Problems
7 Evaluation of surface areas and volumes of revolutions of curves.
8 Evaluation of improper integrals using Beta and Gamma functions
9 Partial differentiation, concept of total derivative
10 Finding maxima and minima of function of two and three variables

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

1. Write the matrix form of a set of linear equations and to analyse the solution of the System of equations
2. Reduce the quadratic form to canonical form
3. Describe the nature of sequence and series
4. Apply the mean value theorems
5. Calculate the extreme values of functions of two variables with / without constraints

UNIT-I

Matrices: Types of Matrices, Symmetric, Hermitian, Skew-symmetric, Skew-Hermitian, orthogonal matrices, Unitary Matrices, rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method. **System of linear equations:** solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II

Eigen values and Eigen vectors: Linear Transformation and Orthogonal Transformation. Eigen values and Eigenvectors and their properties. Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem. Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III

Sequences &Series: Definition of a Sequence, limit, Convergent, Divergent and Oscillatory sequences. **Series:** Convergent, Divergent and Oscillatory Series, Series of positive terms. Comparison test, p-test, D-Alembert's ratio test, Raabe's test, Cauchy's Integral test, Cauchy's root test, logarithmic test.
Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditional Convergence.

UNIT-IV

Single Variable Calculus: Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series.
Applications of definite integrals: To evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates).
Improper Integral: Definitions of Beta and Gamma functions and their applications.

UNIT-V

Multivariable calculus: Definitions of Limit and continuity. Partial Differentiation, Euler's Theorem, Total derivative.

Jacobian: Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Erwinkreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

REFERENCE BOOKS:

1. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE - I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20CH1BS02) CHEMISTRY

Course Objectives: To learn.

1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
2. To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
3. To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry?
4. To acquire the skills pertaining to spectroscopy and to apply them for medical field etc.
5. To impart then knowledge of stereochemistry and synthetic aspects useful for understanding reaction path ways

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

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces
2. Measure various parameters of water and its significance in industrial and domestic purpose
3. Make use of essential aspects of Electro chemistry and Corrosion in industry
4. Explain stereochemistry and synthetic aspects useful for understanding reaction pathways
5. Apply the basic principles of various Spectroscopic techniques in chemical industry and medical field.

UNIT-I

Molecular structure and Theories of Bonding: Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N_2, O_2 and NO molecules. Bond order.

Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d-orbitals in Tetrahedral, Octahedral and square planar geometries. Factors affecting in magnitude of splitting. Magnetic and color properties. Band structure of solids and effect of doping on conductance-doping, P-doping.

UNIT-II

Water and its treatment: Introduction – hardness of water – Causes of hardness. Types of hardness: temporary and permanent. Expression and units of hardness. Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonation. Boiler feed water –Boiler troubles Scale, Sludge, Priming, Foaming and Caustic embrittlement. Treatment. Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water. Ion exchange process. Desalination of water – Reverse osmosis. Numericalproblems

.

UNIT-III

Electrochemistry and corrosion: Electrochemical cells – electrode potential, standard electrode potential, types of electrodes – Calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical Problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium-ion battery).

Causes and effects of corrosion – Theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion. Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of electro chemical corrosion, Corrosion control methods- Cathodic protection – Sacrificial

anode and impressed current cathodic methods. Surface coatings – metallic coatings –Methods of coating-Hot dipping, cementation – Hot Dipping-Galvanization and Tinning. Electroless plating of copper.

UNIT-IV

Representation of 3-dimensional structures, Isomers-Structural and stereoisomers, Enantiomers, diastereomers, symmetry and chirality. Optical activity Absolute configuration. Conformational analysis of n- butane.

Substitution reactions: Nucleophilic substitution reactions: Mechanism of SN1, SN2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoffand anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkyl halides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using KMnO4 and CrO3.

UNIT-V

Spectroscopic techniques and applications: Principles of electronic spectroscopy: Beer's Lamberts law, numerical problems. Types of electronic excitations. Applications of uv-visible spectroscopy. IR Spectroscopy: Principle, modes of vibrations, selection rules, Force constant, some common organic Functional groups wave no. regions (C-H, NH, OH, -COOH, C=0, C≡N, C=C and C≡C) Applications of IR Spectroscopy, H NMR (NMR Spectroscopy) Principle of NMR spectroscopy Chemical shift, chemical shifts of some common organic protons. Introduction to MRI.

TEXTBOOKS:

1. Text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing company (P)Ltd. New Delhi.

REFERENCE BOOKS:

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and. Krishnan
3. University Chemistry, by B.H. Mahan
4. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
5. Organic Chemistry: Structure and Function by K.P.C. VolhardtandandN.E. Schore, 5thEdition

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE - I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EEIES01) BASIC ELECTRICAL ENGINEERING

Course Objectives: To learn.

1. To introduce the basics of electrical circuits and its components
2. To understand DC circuits and AC single phase & three phase circuits.
3. To introduce the concept of power, power factor.
4. To study and understand the different types of magnetic circuits i.e., DC/AC machines and Transformers.
5. To import the knowledge of various electrical installations and power factor improvement methods.

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

1. Solve electrical circuits using basic network laws and theorems.
2. Apply the concept ofAC Circuit parameters and its effect on resonance.
3. Explain the operation of Transformers and its applications.
4. Construct the DC and AC machines and its working principles.
5. Interpret the components of LT Switchgear and installations.

UNIT-I

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, The venin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II

A.C. Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase AC circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV

Electrical Machines: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

UNIT-V

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthling. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXTBOOKS:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Narith, 3rd edition 2010, Tata Mc Graw Hill.
2. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

REFERENCE BOOKS:

1. L.S. Bobrow, Fundamentals of Electrical Engineering”, Oxford University Press, 2011.

2. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010.
3 Electrical Engineering Fundamentals, Vincent Deltora, Second Edition, Prentice Hall, India, 1989.
4. Circuit Theory Analysis and Synthesis, Abhijit Chakrabarti, DhanpatRai & Co, 2016.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE - I Sem	**L**	**T**	**P**	**C**
	1	**0**	**3**	**2.5**

(20ME1ES05) ENGINEERING WORKSHOP

Course Objectives: The objectives of this lab are:

1 To study of different and operated power tools, uses and their demonstration.
2 To gain a good basic working knowledge required for the production of various engineering products.
3 To provide hhands one experience about use of different engineering materials, tools, equipment' sand processes those are common in the engineering field.
4 To develop a right attitude, teamworking, precision and safety a workplace.
5 To explain the constriction, function, use and application of different working tools, equipment and machines.
6 To study commonly used carpentry joints.
7 To have practical exposure to various welding and joining processes.
8 To identify and use marking out tools, hand tools, measuring equipment and to work to prescribed to learners.

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

1. Apply different workshop trades like fitting, carpentry, foundry and welding.
2. Practiceworkshoptrades like Tim smithy, Blacksmithy.
3. Apply suitable tools for different trades of engineering processes in clouding drilling, material removing, measuring, chiseling.
4. Apply basic electrical engineering knowledge for house wiring practice.
5. Demonstrate various machines, tools and their operations.

1. TRADES FOREXERCISES:

At least two exercises from each trade:

I. Carpentry– (T-Lap Joint, Dovetail Joint, Mortise&Tenon Joint)
II. Fitting– (V-Fit, Dovetail Fit&Semi-circular fit)
III. Tin-Smithy– (Squarein, RectangularTray&ConicalFunnel)
IV. Foundry– (Preparationof Greens andMould usingSinglePieceand Split Pattern)
V. WeldingPractice– (Arc Welding&GasWelding)
VI. House-wiring–(Parallel&Series,Two-waySwitchand TubeLight)
VII. BlackSmithy– (Round to Square, Fan Hook andS-Hook)

2. TRADES FOR DEMONSTRATION &EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working.

TEXTBOOKS:

1. Workshop Practice /B. L. Juneja /Cengage.
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

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

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE - I Sem	**L**	**T**	**P**	**C**
	2	**0**	**0**	**2**

(20EN1HS01) ENGLISH

Course Objectives: The objectives of this lab are:

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

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

1. Use English Language effectively in spoken and written communication.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Demonstrate basic proficiency in English including reading and listening comprehension, writing and speaking skills.
5. Improve language proficiency to meet their academic and professional needs.

UNIT-I

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes. Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions. Reading: Reading and Its Importance- Techniques for Effective Reading. Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – Paragraph writing – Types, Structures and Features of a Paragraph - Creating Coherence- Organizing Principles of Paragraphs in Documents.

UNIT-II

'Ancient Architecture in India' from the prescribed textbook 'English for Engineers' published by Cambridge University Press. Vocabulary: Synonyms and Antonyms. Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement. Reading: Improving Comprehension Skills – Techniques for Good Comprehension Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Job Application withResume.

UNIT-III

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press. Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses. Reading: Sub-skills of Reading- Skimming and Scanning Writing: Nature and Style of Sensible Writing- Defining- Describing Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT-IV

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press. Vocabulary: Standard Abbreviations in English Grammar: Redundancies and Clichés in Oral and Written Communication. Reading: Comprehension- Intensive Reading and Extensive Reading Writing: Writing Practices--Writing Introduction and Conclusion - Essay Writing-

Précis Writing.

UNIT-V

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press. Vocabulary: Technical Vocabulary and their usage Grammar: Common Errors in English Reading: Reading Comprehension-Exercises for Practice Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

TEXTBOOKS:

1. Sudarshana, N.P. andSavitha, C. (2018). English for Engineers. Cambridge UniversityPress.

REFERENCE BOOKS:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford UniversityPress.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper ResourceBook.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge UniversityPress.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford UniversityPress.
7. Raju, Yadava B, B T Sujatha & C, Murali Krishna. English for Better Performance, Orient Black swan, Pvt., Ltd, 2014.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE - I Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

(20CH1BS03) ENGINEERING CHEMISTRY LAB

Course Objectives: The chemistry laboratory course consists of experiments related to the principles of chemistry required to the engineering student. The course will make the student to learn:

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. The measurement of physical properties like adsorption and viscosity.
4. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

Course outcomes: The experiments will make the student gain skills on

1. An ability to analyze the quality of water by determining its chemical parameters.
2. The synthesis of common drugs like Paracetamol and Aspirin.
3. Determination of rate constant of a reaction from concentration – time relationships.
4. Determination ofphysical properties like adsorption andviscosity of lubricants.
5. Estimation of different types of qualitative and quantitative measurements of a given compound.

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA.
2. Estimation of Fe+2byDichrometry.
3. Estimation of an HCl by Conductometric titrations.
4. Estimation of Acetic acid by Conductometric titrations.
5. Estimation of HCl by Potentiometric titrations.
6. Estimation of Fe2+ by PotentiometryusingKMnO4.
7. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol.
9. Thin layer chromatography calculation of R-values. Eg- ortho and para nitrophenols
10. Determination of acid value of coconut oil.
11. Verification of Freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of viscosity of Coconut oil and ground nut oil by using Ostwald's viscometer.
13. Determination of surface tension of a give liquid using stalagmometer.
14. Determination of partition coefficient of acetic acid between n-butanol and water.

REFERENCE BOOKS:

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand &Co., Delhi).
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi).
3. Vogel's text book of practical organic chemistry 5thedition.
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE - I Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

(20EN1HS02) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Course Objectives: To learn.

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

Course outcomes: Students should be able to

1. Employ the nuances of English language through audio-visual experience and group activities.
2. Articulate a neutral accent of English for intelligibility by overcoming mother tongue influence.
3. Develop the skill of using appropriate language in various speaking contexts.
4. Take part in oral presentations using formal language.
5. Improve speaking skills with clarity and confidence which in turn enhance their interpersonal skills.

Unit-I

EXERCISE – I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening. Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.

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

EXERCISE – II

CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.

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

EXERCISE – III

CALL Lab:

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:

Understand: How to make Formal Presentations. Practice: Formal Presentations.

EXERCISE – IV

CALL Lab:

Understand: Listening for General Details. Practice: Listening Comprehension Tests. ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks.

Practice: Making a Short Speech – Extempore.

EXERCISE – V
CALL Lab:
Understand: Listening for Specific Details. Practice: Listening Comprehension Tests. ICS Lab: Understand: Interview Skills.
Practice: Mock Interviews.

TEXTBOOKS:

1. ELCS Lab Manual
   (The course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech. First English)

REFERENCE BOOKS:

1. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
2. Speaking English Effectively 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
3. Sasi Kumar, V &Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
4. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Black swan. Hyderabad.
6. Hewing's, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP Marks, J. 2009. English Pronunciation in Use. Eleme
7. English Pronouncing Dictionary Daniel Jones Current Edition with CD.
8. A textbook of English Phonetics for Indian Students by T. Balasubramanian (Macmillan) Cambridge: CUP

0 0 2 1

(20EE1ES03) BASIC ELECTRICAL ENGINEERING LAB

Course Objectives: To learn.

1. To analyze and understand behavior given network by applying various electrical laws and network theorems.
2. To know the response of electrical circuits for different excitations.
3. To determine, measure and know the relation between basic electrical quantities.
4. To analyze the performance characteristics of DC and AC electrical machines.

Course outcomes:

1. Explain the basic electrical laws.
2. Produce the response in different types of electrical circuits to different excitations
3. Solve the response of electrical circuits under resonance condition.
4. Calculate the measuring parameters and relation between the basic electrical parameters
5. Evaluate the basic characteristics of transformers and electrical machines.

List of experiments/demonstrations:

1. Verification of Ohms Law.
2. Verification of KVL and KCL.
3. Transient Response of Series RL and RC circuits using DC excitation.
4. Transient Response of RLC Series circuit using DC excitation.
5. Resonance in series RLC circuit.
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer.
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation).
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star).
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit.
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor.
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor.
13. Performance Characteristics of a Three-phase Induction Motor.
14. Torque-Speed Characteristics of a Three-phase Induction Motor.
15. No-Load Characteristics of a Three-phase Alternator.

3 1 0 4

(20MA2BS04) MATHEMATICS – II

Course Objectives: To learn.

1. Methods of solving the differential equations of first and higher order.
2. Evaluation of multiple integrals and their applications.
3. The physical quantities involved in engineering field related to vector valued functions.
4. The basic properties of vector valued functions and their applications to line, Surface and volume integrals.

Course outcomes: After learning the contents of this paper the student will be able to

1. Determine different types of ordinary differential equations of first order.
2. Apply the concepts of higher differential equation to solve real world problems.
3. Apply the concept of multiple integrals to find areas and volumes
4. Evaluate the Centre of mass and gravity for cubes, sphere and rectangular parallelepiped.
5. Calculate the line, surface and volume integrals and converting them from one to another.

UNIT-I

First Order Ordinary Differential Equations: Exact, linear and Bernoulli's equations. **Applications:** Newton's law of cooling, Law of natural growth and decay. **Equations not of first degree:** equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT-II

Ordinary Differential Equations of Higher Order: Second order linear differential equations with constant coefficients. Non-Homogeneous terms of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x, $e^{ax}V(x)$ and $xV(x)$. Method of variation of parameters. **Equations reducible to linear ODE with constant coefficients:** Legendre's equation, Cauchy-Euler equation.

UNIT-III

Multiple Integrals: Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form). **Evaluation of Triple Integrals:** Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. **Applications:** Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallelepiped).

UNIT-IV

Vector Differentiation: Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors.

UNIT-V

Vector Integration: Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Erwinkreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

REFERENCE BOOKS:

1. **Paras Ram**, Engineering Mathematics, 2nd Edition, CBS Publishers.
2. **S. L. Ross**, Differential Equations, 3rd Ed., Wiley India, 1984.

3 1 0 4

(20AP2BS05) APPLIED PHYSICS

Course Objectives: To learn.

1. Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
2. Students will be able to demonstrate competency and understanding of the concepts found in Quantum Mechanics, Fiber optics and lasers, Semiconductor physics and Electromagnetic theory and a broad base of knowledge in physics.
3. The graduates will be able to solve non-traditional problems that potentially draw on knowledge in multiple areas of physics.
4. To study applications in engineering like memory devices, transformer core and electromagnetic machinery.

Course outcomes: After learning the contents of this paper the student will be able to

1. Demonstrate the fundamentals concepts of modern physics and quantum mechanics.
2. Design various electronic circuits using fundamentals of Semiconductor physics.
3. Apply the concepts of optoelectronic in various optoelectronic devices.
4. Apply the learned knowledge of laser and fiber optics in communication system.
5. Analyze various magnetic and Electromagnetic properties applicable in magnetic materials.

UNIT – I

Quantum Mechanics: Introduction to quantum physics, Black body radiation, Planck's law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box

UNIT - II

Semiconductor Physics: Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination. **Carrier transport**: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics. **Bipolar Junction Transistor (BJT)**: Construction, Principle of operation.

UNIT - III

Optoelectronics: Radiative and non-radiative recombination mechanisms in semiconductors. **LED and semiconductor lasers**: Device structure, Materials, Characteristics and figures of merit, Semiconductor. **Photodetectors**: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

UNIT - IV

Lasers and Fibre Optics Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, pumping. Types of Lasers: Ruby laser, Carbon dioxide (CO2) laser, He-Ne laser, Applications of laser. **Fibre Optics**: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibers, Applications of optical fibres

UNIT - V

Electromagnetism and Magnetic Properties of Materials: Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations, Polarization, Permittivity and Dielectric constant, Internal fields in a solid, Clausius- Mossotti equation, **Ferroelectrics and** Piezoelectric. Magnetization, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials.

TEXTBOOKS:

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learning
2. Halliday and Resnick, Physics - Wiley
3. A textbook of EngineeringPhysics, Dr. M. N. AvadhanuluDr. P.G. Kshirsagar - S. Chand

REFERENCE BOOKS:

1. Richard RobinettQuantum Mechanics
2. Singh, Semiconductor OptoelectronicsJPhysics and TechnologyMc Graw-Hill inc. (1995).
3. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Guptha on NPTEL

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20CS2ES04) PROGRAMMING FOR PROBLEM SOLVING

Course Objectives: To learn.

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. To learn the usage of structured programming approach in solving problems.

Course outcomes: The student able to

1. Build the algorithm for the given unsolved problems.
2. Apply the concepts of arrays, strings, structures and pointers to find the solution for the given problem.
3. Apply the various preprocessor commands in a given different real time situations.
4. Dissect a problem into sub functions to develop modular reusable code.
5. Demonstrate various searching, sorting techniques along with the complex city analysis.

UNIT - I

Introduction to Programming Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems, **Introduction to Algorithms**: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming, Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments, **Bitwise operation**s: Bitwise AND, OR, XOR and NOT operators, Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops, **I/O:** Simple input and output with scan of and print of, formatted I/O, Introduction to stdin, stout and stderr, Command line arguments.

UNIT - II

Arrays, Strings, Structures and Pointers: Arrays: one- and two-dimensional arrays, creating, accessing and manipulating, elements of arrays. **Strings**: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings. Structures: Defining structures, initializing structures, unions, Array of structures.

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation) Enumeration data type.

UNIT - III

Preprocessor and File handling in C: Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef. **Files**: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT - IV

Function and Dynamic Memory Allocation: Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries, **Recursion**: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions. **Dynamic memory allocation**: Allocating and freeing memory, Allocating memory for arrays of different data types.

UNIT - V

Introduction to Algorithms: Algorithms for finding roots of quadratic equations, finding minimum and

maximum numbers of a given set, finding if a number is prime number, etc. Basic **searching in an array of elements** (linear and binary search techniques), **Basic algorithms to sort array of elements** (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs.

TEXTBOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. R.G. Dromey, how to solve it by Computer, Pearson (16th Impression).
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.

(20ME2ES02) ENGINEERING GRAPHICS

Course Objectives: To learn.

1. To provide basic concepts in engineering drawing.
2. To impart knowledge about standard principles of orthographic projection of objects.
3. To draw sectional views and pictorial views of solids.

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

1. Apply the principles of engineering graphics to create engineering drawings of various geometric construction, conic section, curves and scales as per BIS standards.
2. Construct orthographic projections for points, lines and planes in different quadrants and auxiliary views.
3. Draw the sectional views and true shape of sections of solids, by applying the principles of projections.
4. Draw the development of surfaces and intersections of solids in real time situations.
5. Develop isometric and orthographic views of the objects.

UNIT – I

INTRODUCTION TO ENGINEERING DRAWING: Principles of EngineeringGraphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain & Diagonal.

UNIT- II

ORTHOGRAPHIC PROJECTIONS: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. —Auxiliary Planes.

UNIT – III

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere.

UNIT – IV

D**evelopment of Surfaces of Right Regular Solids** – Prism, Cylinder, Pyramid and Cone, Intersection of Solids: Intersection of – Prism vs Prism- Cylinder Vs Cylinder.

UNIT – V

ISOMETRIC PROJECTIONS: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions.

INTRODUCTION TO CAD: (**For Internal Evaluation Weight age only**): Introduction to CAD Software Package Commands. - Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package.

TEXTBOOKS:

1. Engineering Drawing N.D. Bhatt /Charotar.
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford.

REFERENCE BOOKS:

1. Engineering Drawing / Basant Agrawal and Mc Agrawal/ McGraw Hill
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

(20AP2BS06) APPLIED PHYSICS LAB

Course outcomes: The student will be

1. Compute the (V-I/P-I) characteristics of LED, LASER, and Solar cell.
2. Calculate the energy gap of semiconductor diode.
3. Interpret the theory of Hall Effect with experiment by determining the Hall coefficient.
4. Examine the bending losses for different Optical fiber Cables.
5. Construct various circuits –Resonance, Time constant and Magnetic field using LCR, RC, Stewart and Gees circuits.

List of experiments:

1. Energy gap of P-N junction diode:
   To determine the energy gap of a semiconductor diode
2. Solar Cell: To study the V-I Characteristics of solar cell.
3. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.
4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect: To determine work function of a given material.
7. LASER: To study the characteristics of LASER sources.
8. Optical fibre: To determine the bending losses of Optical fibres.
9. LCR Circuit: To determine the Quality factor of LCR Circuit.
10. R-C Circuit: To determine the time constant of R-C circuit.

Note: Any 8 experiments are to be performed.

REFERENCE BOOKS:

1. Laboratory Manual of Engineering Physics by DrY. Aparna &Dr. K Venkateswara Rao (V.G.S Publishers)
2. Engineering physics Practical's by Dr. B. Srinivasa Rao, V.K.V. Krishna. K.S. Rudra mamba.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

(20CS2ES06) PROGRAMMING FOR PROBLEM SOLVING LAB

Course Objectives: The students will learn the following

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To write programs using the Dynamic Memory Allocation concept.
6. To create, read from and write to text and binary files.

Course outcomes: The student will be able to:

1. Formulate The Algorithms for Simple Problems.
2. Translate the given algorithms to C program.
3. Correct the logical errors found during program execution.
4. Make use of pointers in different types to modularize the code with functions.
5. Apply the appropriate sorting techniques for the given list of elements.

Practice sessions:

a. Write a simple program that prints the results of all the operators available in C (including pre/ post increment, bitwise and/or/not, etc.). Read required operand values from standard input.
b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values form standard input.

Simple numeric problems:

a. Write a program for fiend the max and min from the three numbers.
b. Write the program for the simple, compound interest.
c. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
   5 x 1 = 5
   5 x 2 =10
   5 x 3 =15
e. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s= ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
c. Write a program that finds if a given number is a prime number
d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user**.**
g. Write a C program to find the roots of a Quadratic equation.
h. Write a C program to calculate the following, where x is a fractional value.

1-x/2 +x^2/4-x^3/6

i. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+.....+x^n. For example: if n is 3 and x is 5, then the program compute 1+5+25+125.

Arrays and Pointers and Functions:

a. Write a C program to find the minimum, maximum and average in an array of integers.

b. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.

c. Write a C program that uses functions to perform the following:
   i. Addition of Two Matrices
   ii. Multiplication of Two Matrices
   iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.

d. Write C programs that use both recursive and non-recursive functions
   i. To find the factorial of a given integer.
   ii. To find the GCD (greatest common divisor) of two given integers.
   iii. To find x^n

e. Write a program for reading elements using pointer into array and display the values using array.

f. Write a program for display values reverse order from array using pointer.

g. Write a program through pointer variable to sum of n elements from array.

Files:

a. Write a C program to display the contents of a file to standard output device. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

d. Write a C program that does the following:
It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (Hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (Hint: use of seek function) The program should then read all 10 values and print them back. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

e. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Strings:

a) WriteaCprogramto convertRoman numeral rangingfromItoLtoitsdecimal equivalent.

b) Writea C programthatconvertsanumberrangingfrom1 to 50to Roman equivalent

c) WriteaCprogram thatusesfunctionstoperform thefollowing operations:
i)ToinSerta sub-string into a givenmainstringfroma given position.
ii)TodeletenCharactersfroma givenpositioninggiven string.

d) Writea Cprogramtodetermineifthe givenstringisa palindrome ornot (Spelled sameinbothdirectionswith orwithoutameaninglikemadam, civic, noon, abcba, etc.)

e) WriteaCprogramthatdisplaysthepositionofacharacter chinthestrings or–1ifS doesn't 'tcontains Ch.

f) Writea Cprogramto count thelines, wordsandcharactersin a given text**.**

Miscellaneous:

1. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to

be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

2. Write a C program to construct a pyramid of numbers as follows:

1	*	1	1	*
1 2	* *	2 3	2 2	* *
1 2 3	* * *	4 5 6	3 3 3	* * *
			4 4 4 4	* *
				*

Sorting and Searching:

a. Write a C program that uses non recursive function to search for a key value in a given list of integers using linear search method.
b. Write a C program that uses non recursive function to search for a key value in a given sorted list of integers using binary search method.
c. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.
d. Write a C program that sorts the given array of integers using selection sort in descending order
e. Write a C program that sorts the given array of integers using insertion sort in ascending order
f. Write a C program that sorts a given array of names.

Suggested Reference Books for solving the problems:

i. Byron Gottfried, Schum's Outline of Programming with C, McGraw-Hill
ii. B.A. Farozan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
iii. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice
iv. Hall of India
v. R.G. Dromey, how to solve it by Computer, Pearson (16th Impression)
vi. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
vii. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I Year B.Tech. EEE-II Sem

L	**T**	**P**	**C**
3	**0**	**0**	**0**

(20MC2ES07) ENVIRONMENTAL SCIENCE

Course Objectives:

1. Understanding the importance of ecological balance for sustainable development
2. Understanding the impacts of developmental activities and mitigation measures
3. Understanding the environmental policies and regulations

Course outcomes: Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn help in sustainable development. The students should be able to:

1. Explain the concept of ecological perspective and the value of the environment.
2. Value the significance of various natural resources and its management.
3. Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.
4. Identify different types of pollution and their control measures, effective methods of waste management with best possible solutions.
5. Develop an awareness about environmental laws and sustainable development

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnifications, ecosystem value, services and carrying capacity, Field visits

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources**: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources**: use and exploitation, environmental effects of extracting and using mineral resources, **Land resources**: Forest resources, **Energy resources**: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies

UNIT-III

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution**: Primary and secondary pollutants, Automobile and Industrial pollution, ambient air quality standards. **Water pollution**: Sources and types of pollution, drinking water quality standards. **Soil Pollution**: Sources and types, Impacts of modern agriculture, degradation of soil.

Noise Pollution: Sources and Health hazards, standards, **Solid waste**: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies**: Waste water Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC- GoI Initiatives.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards

Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXTBOOKS:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition
4. Environmental Studies by Anubha Kaushik, 4thEdition, new age international publishers.
5. Text book of Environmental Science and Technology- Dr. M. Anji Reddy 2007, BS Publications
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-I Sem

L	**T**	**P**	**C**
3	**0**	**0**	**3**

(20EE3PC01) ANALOG ELECTRONICS

Course Objectives:

1. To introduce components such as diodes, BJTs and FETs their switching characteristics and applications.
2. Learn the concepts of small frequency analysis of transistors and FETs.
3. To give understanding of various types of basic and feedback amplifier circuits such as cascaded, large signal amplifiers.
4. To introduce the basic building blocks of linear integrated circuits.
5. To introduce the concepts of waveform generation and introduce some special function ICs.

Course outcomes: Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn help in sustainable development. The students should be able to:

1. Apply the concepts of diode, transistors and amplifiers
2. Use the principles of FET for high frequency circuits
3. Explain about multistage amplifiers and power amplifiers
4. Summarize various feedback amplifiers and oscillators.
5. Design circuits using OP-AMP for various application

Pre-requisite: UNIT – I

Diode Circuits:P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, clamping and clipping circuits. Input output characteristics of BJT in CB, CE, CC Configurations, Analysis and Design of small signal Low Frequency Single stage BJT Amplifiers

UNIT – II

JFET Amplifiers: Analysis of JFET Amplifiers, Analysis of CS, CD, CG, JFETAmplifiers, Comparison ofPerformance with BJT Amplifiers, Basic

MOSFET Circuits: MOSFET small signal Equivalent circuits - gain, input and output impedances, small-signal model of common-source, Common-gate and common-drain amplifiers.

UNIT – III

Multi-Stage and Power Amplifiers: Direct coupled and RC Coupled multi-stage amplifiers; Differential Amplifiers, Power amplifiers - Class A, Class B, Class C.

UNIT – IV

Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers – General Characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristicsVoltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simpleproblems.

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, L C type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.

UNIT – V

Operational Amplifiers: Ideal op-amp, Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave and triangular-wave generators.

TEXTBOOKS:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education, 2nd edition
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 2003

REFERENCE BOOKS:

1. Electronic Devices Conventional and current version -Thomas L. Floyd 2015, Pearson.
2. J. Millman and A. Grable, “Microelectronics”, McGraw Hill Education, 1988.

3. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
4. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

3 1 0 4

(20EE3PC02) ELECTRICALCIRCUITANALYSIS

Prerequisite: Mathematics - II (Ordinary Differential Equations and Multivariable Calculus) & Basic Electrical Engineering

Course Objectives:

1. To understand Magnetic Circuits, Network Topology and Three phase circuits
2. To analyze transients in Electrical systems.
3. To evaluate Network parameters of given Electrical network
4. To design basic filter configurations

Course outcomes: After the end of this course, students will demonstrate the ability to

1. Applynetworktheoremsfortheanalysesisofelectrical circuits.
2. Calculate the solution of first & second order networks.
3. Comparethetransient andsteady-stateresponseof electrical circuits with DC and AC Excitations.
4. Analyzecircuitsinthesinusoidalsteady-state(single-phaseandthree-phase).
5. Solve the electrical circuits using Laplace Transforms.
6. Interpret the two-port network and network functions.

UNIT – I

Network Theorems: Superposition theorem, The venin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks.

UNIT – II

Solution of First and Second order Networks: Solution of first and second order differential equations for Series and parallel R-L, R-C, RL-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response for DC and AC Excitations.

UNIT – III

Sinusoidal SteadyStateAnalysis: Representationof sine function as rotatingphasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

UNIT – IV

Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, and transformed network with initial conditions. Transfer function representation. Poles andZeros.Frequencyresponse (magnitude andphase plots), seriesandparallel resonances

UNIT – V

Two Port Network and Network Functions: Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, inter connections of two port networks.

TEXTBOOKS:

1. S. Sivanagaraju G. Kishor and C. Srinivasa Rao “Electrical Circuit Analysis”, Ceneage Learning India Pvt Ltd, 2009
2. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall,2006.
3. D. Roy Choudhury, “Networks and Systems”, NewAgeInternationalPublications,1998

REFERENCE BOOKS:

1. W.H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", Mc Graw Hill Education, 2013.
2. C. K. AlexanderandM.N.O. Sadiku, "ElectricCircuits", McGrawHillEducation,2004.
3. K. V. V. Murthy and M.S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.
4. A Sudhakar and Shyammohan S Palli, "Circuits and Networks Analysis and Synthesis, 5e"
5. McGraw Hill Education, 1999

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20EE3PC03) ELECTRICALMACHINES- I

Course Objectives: TostudyandunderstanddifferenttypesofDCgeneratorsMotorsandTransformers o f its construction, operation and applications.

1. To study and understand different types of DC generators, Motors and Transformers of its construction, operation and applications.
2. To analyze performance aspects of various testing methods

Course outcomes: After the end of this course, students will demonstrate the ability to

1. Identify different parts of a DC machine &understand its operation
2. Use the testing methods to predetermine the efficiency of DC machines
3. Analyze single phase and three phase transformers circuits.
4. Construct the single phase and three phase transformer circuits.

UNIT-I

D.C. Generators: Principle of operation – Action of commutator – constructional features – armature windings –lapandwave windings –simplexandmultiplex windings–useoflaminated armature–E.M. F Equation. Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensatingwinding–commutation–reactancevoltage–methodsofimprovingcommutation. MethodsofExcitationSeparatelyexcitedandself-excitedgenerators–build-upofE.M. F-criticalfieldresistanceandcriticalspeed - causes for failure to self-excite and remedial measures. Load characteristics of shunt, seriesand compound generators.

UNIT-II

D.C Motors: Principle of operation – Back E.M.F. - Torque equation – characteristics and applicationof shunt, series and compound motors – Armature reaction and commutation. Speed control of D.C. Motors - Armature voltage and field flux control methods. Motor starters (3-point and 4-point starters) Testing of D.C. machines - Losses – Constant & Variable losses – calculation of efficiency – conditionformaximumefficiency.

UNIT-III

TestingofDCMachines: Methodso testing–direct, indirect, andregenerative testing–Brake test – Swinburne'stest–Hopkinson'stest–Field'stest-separationofstraylossesinad.c. motor test.

UNIT-IV

Single Phase Transformers: Types - constructional details-minimization of hysteresis and eddy currentlosses-EMFequation -operation on no loadand on load -phasor diagrams Equivalentcircuit-lossesandefficiency–regulation-Alldayefficiency-effectofvariationsoffrequency& supplyvoltage oniron losses.

UNIT-V

Testing of Transformers and Poly-Phase Transformers: OC and SC tests - Sumner's test - predeterminationofefficiencyandregulation-separationoflossestest-parallelоperationwithequalandunequalvoltageratios-autotransformers-equivalentcircuit-comparisonwithtwowindingtransformers. Poly-phasetransformers–Poly-phaseconnections-Y/Y,Y/Δ,Δ/Y,Δ/ΔandopenΔ

TEXTBOOKS:

1. A. E. Fitzgerald and C. Kingsley "Electric Machinery", New York, McGrawHillEducation,2013.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers,2011.

REFERENCE BOOKS:

1. G. Say, "Performance and design of AC machines", CBS Publishers,2002.
2. A.E. Clayton and N.N. Hancock, "Performance and design of DC machines", CBSPublishers,2004.
3. J. Nagrath and D. P. Kothari, "Electric machines", Mc Graw Hill Education, 2010.

3 1 0 4

(20EE3PC04) ELECTROMAGNETIC FIELDS

Course Objectives:

1. To introduce the concepts of electric field and magnetic field
2. Boundary conditions of conductors &dielectrics.
3. Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.

Course outcomes: After the end of this course, students will demonstrate the ability to

1. Explain the basic laws of electromagnetism
2. Describe the electric and magnetic fields for simple configurations under static conditions
3. Analyze time varying electric and magnetic fields.
4. Use Maxwell's equation in different forms and different media.
5. Analyze the propagation of EM waves in conductors.

UNIT - I

Static Electric Field: Review of conversion of a vector from one coordinate system to another coordinate system, Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density

UNIT - II

Conductors, Dielectrics and Capacitance: Current and current density, Ohms Law in Point form, Continuity equation, Boundary conditions of conductors and dielectric materials. Capacitance, Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation.

UNIT - III

Static Magnetic Fields and Magnetic Forces: Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors. Force on a moving charge, Force on a differential current element, Force between differential current elements, Magnetic boundary conditions, Magnetic circuits, Self- inductances and mutual inductances.

UNIT - IV

Time Varying Fields and Maxwell's Equations: Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces.

UNIT - V

Electromagnetic Waves: Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane wave in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors. Poyntingtheorem.

TEXTBOOKS:

1. 1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014
2. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.
3. Roald K. Wangsness "Electromagnetic Fields" John Wiley & Sons Publication, 2007 (2nd ed.)

REFERENCE BOOKS:

1. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India,2012.
2. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans,1954
3. W. J. Duffin, "Electricity and Magnetism", McGraw Hill Publication,1980

4. W. J. Duffin, “Advanced Electricity and Magnetism”, McGraw Hill,1968
5. E. G. Cullwick, “The Fundamentals of Electromagnetism”, Cambridge University Press,1966.
6. B. D. Popovic, “Introductory Engineering Electromagnetics”, Addison-Wesley Educational Publishers, International Edition,1971.
7. A. Pramanik, “Electromagnetism - Theory and applications”, PHI Learning Pvt. Ltd, New Delhi, 2009

3 0 0 3

(20EE3ES08) ENGINEERING MECHANICS

Course Objectives:

1. Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
2. Perform analysis of bodies lying on rough surfaces
3. Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections.
4. Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies
5. Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations.

Course outcomes: At the end of the course, students will be able to

1. Solve problems related to resultant of forces acting on a body and equilibrium of a body subjected to a system of forces
2. Solve problem of bodies' subject antifriction and find Centre of Gravity.
3. Calculate moment of inertia of Eigen section
4. Solve problem on Particle dynamics and work kinetic energy
5. Solve problem of D'Alembert's principle and its applications, work energy principle and kinetics of rigid body rotation.

UNIT – I

INTRODUCTION TO ENGINEERING MECHANICS– Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

UNIT – II

FRICTION: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.

CENTROID AND CENTRE OF GRAVITY: Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; center of gravity of bodies, Centre of Gravity and its implications. – Theorem of Pappus.

UNIT – III

AREA MOMENTS OF INERTIA: introduction-definition of moment of inertia -polar moment of inertia, transfer theorem for moment of inertia, mass moment of inertia: radius of gyration Momentofinertiaofstandardsectionsandcomposite sections, transfer formula for product of inertia.

UNIT - IV

REVIEW OF PARTICLE DYNAMICS – Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, andpolar coordinates). Work-kinetic energy, power, potentialenergy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

UNIT – V

KINETICS OF RIGID BODIES – Basic terms, general principles in dynamics; Types of motion, motion in curved path-work, energy and power, Instantaneous center of rotation in plane motion and simple problems; D'Alembert's principle, principle of conservation of Work Energy and its application in plane motion of connected bodies; Kinetics of rigid body in rotation, translation-work done

TEXTBOOKS:

1. Shames and Rao (2006), Engineering Mechanics, PearsonEducation
2. Reddy Vijay Kumar K. and J. Suresh Kumar (2010), Singer's Engineering Mechanics – Statics &Dynamics

REFERENCE BOOKS:

1. TimoshenkoS.PandYoungD.H., "EngineeringMechanics", McGrawHillInternationalEdition, 1983.
2. Andrew Pytel, JaanKiusalaas, "Engineering Mechanics", Cengage Learning,2014.
3. Beer F.P & Johnston E.R Jr. Vector, "Mechanics for Engineers", TMH,2004.
4. Hibbeler R.C & Ashok Gupta, "Engineering Mechanics", Pearson Education,2010.
5. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications,2011.
6. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press,2008.
7. Meriam. J. L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons,2008

0 0 2 1

(20EE3PC05) ANALOG ELECTRONICS LAB

Course Objectives:

1. To introduce components such as diodes, BJTs and FETs their switching characteristics, &applications
2. Learn the concepts of small frequency analysis of transistors and FETs.
3. To give understanding of various types of basic and feedback amplifier circuits such as cascaded, large signal amplifiers.
4. To introduce the basic building blocks of linear integrated circuits.
5. To introduce the concepts of waveform generation and introduce some special function ICs.

Course outcomes: At the end of this course, students will demonstrate the ability to

1. Use P-N junction diode in rectifiers and filters.
2. Demonstrate transistor and amplifier characteristics.
3. Analyze various circuits using Op-Amp.
4. Design different oscillator circuits.
5. Construct different types of power amplifiers

List of Experiments

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.
2. Full Wave Rectifier with & without filters
3. Common Emitter Amplifier Characteristics
4. Common Base Amplifier Characteristics
5. Common Source amplifier Characteristics
6. Inverting and Non-inverting Amplifiers using Op Amps.
7. Adder and Subtractor using Op Amp.
8. Integrator Circuit using IC 741.
9. Differentiator circuit using Op Amp.
10. RC Phase shift Oscillator
11. Colpitts 'Oscillator Design
12. Hartley Oscillators Design
13. Class A power amplifier
14. Class B power amplifier

Major Equipment's required for Laboratories:

1. CROs: 20MHz
2. Function Generators: 2MHz
3. Spectrum Analyzer
4. Regulated Power Supplies: 0-30V
5. Millimeters

II Year B.Tech. EEE-I Sem

L	T	P	C
0	0	2	1

(20EE3PC06) ELECTRICAL CIRCUITS LAB

Course outcomes: After Completion of this lab the student sable to

1. Analyze complex DC and AC linear circuits
2. Apply concepts of electrical circuits across engineering
3. Evaluate response in a given network busing theorems
4. Calculate the parameters in two port networks
5. Evaluate the time response and locus diagrams of first order electrical circuits
6. Calculate the Active and Reactive power for three phase balanced loads

The following experiment Sar required to be conducted compulsory experiments

1. Verification f Thevenin's and Norton's Theorems
2. Verification of Superposition, Reciprocity and Maximum Power Transfer theorems
3. Locus Diagrams and RC Series Circuit
4. Series and Parallel Resonance
5. TimeresponseoffirstorderRC/RLnetworkforperiodicnonsinusoidalinputs
   Time constant and SteadyState error determination.
6. Twoport networkparameters–Z–Parameters, Analytical verification.
7. Two port network parameters–A, B, C, D&Hybridparameters, Analyticaverification
8. SeparationofSelfandMutualinductanceinaCoupledCircuit.DeterminationofCo-efficientofCoupling.

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

1. Verification of compensation& Milliman's theorems
2. HarmonicAnalysisofnon-sinusoidalwaveformsignalsusingHarmonicAnalyzer andplotting frequency spectrum.
3. Determination of form factor of non-sinusoidal waveform
4. Measurement of Active Power for Star and Delta connected balanced loads
5. Measurement of Reactive Power for Star and Delta connected balanced loads

TEXTBOOKS:

1. S. Sivanagaraju, G. Kishor and C. Srinivasa Rao "Electrical Circuit Analysis", Ceneage Learning India Pvt Ltd, 2009.
2. M. E. Van Valkenburg, "Network Analysis", PrenticeHall,2006.
3. D. Roy Choudhury, "Networks and Systems", New Age InternationalPublications,1998.

REFERENCE BOOKS:

1. W.H. HaytandJ. E. Kemmerly, "EngineeringCircuit Analysis", McGrawHillEducation, 2013.
2. C. K. AlexanderandM.N.O. Sadiku, "ElectricCircuits", McGrawHillEducation,2004.
3. K. V. Murthy and M.S. Kamath, "BasicCircuitAnalysis", JaicoPublishers, 1999.
4. A Sudhakar and Shyamohan S Palli, "Circuits and Networks Analysis and Synthesis, 5e"McGraw Hill Education, 1999.

I I Year B.Tech. EEE-I Sem

L	T	P	C
0	0	2	1

(20EE3PC07) ELECTRICALMACHINESLAB–I

Prerequisites: Electrical Machines-I

Course Objectives:

1. To expose the students to the operation of DC Generator
2. To expose the students to the operation of DC Motor.
3. To examine the self-excitation in DC generators

Course outcomes: After Completion of this lab the student sable to

1. Experiment to start and control the Different DC Machines.
2. Assess the performance of different machines using different testing methods
3. Identifydifferentconditionsrequiredtobesatisfiedforself-excitationof DC Generators
4. Separate iron losses of DC machines in to different components
5. Identify various parts of electrical DC machines

The following experiments are required to be conducted compulsory experiments:

1. Magnetization characteristics of DC shunt generator (Determinationofcriticalfieldresistanceandcriticalspeed)
2. Load test on DC shunt generator (Determination of characteristics)
3. Load test on DC series generator (Determination of characteristics)
4. Load test on DC compound generator (Determination of characteristics.
5. Hopkinson's test on DC shunt machines (Predetermination of efficiency)
6. Fields test on DC series machines (Determination of efficiency)
7. Swinburne's test and speed control of DC shunt motor (Predetermination of efficiencies)
8. Brake test on DC compound motor (Determination of performance curves)

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

1. Brake test on DC shunt motor (Determination of performance curves)
2. Retardation test on DC shunt motor (Determination of losses at rated speed
3. Separation of losses in DC shunt motor.

TEXTBOOKS:

1. A.E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. P.S. Bimbhra, "ElectricalMachinery", KhannaPublishers,2011

REFERENCE BOOKS:

1. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
2. A.E. Clayton and N.N. Hancock, "PerformanceanddesignofDCmachines", CBSPublishers,2004
3. J. NagrathandD. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

II Year B.Tech. EEE-I Sem

L	T	P	C
2	0	0	0

(20MC3HS01): PROFESSIONAL & ENGINEERING ETHICS

Course Objectives: To enable the students to imbibe and internalize the Values and Ethical Behavior in the personal and Professional lives.
Course outcomes: The students will understand the importance of Values and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

UNIT – I
Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT – II
Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

UNIT – III
Professional Practices in Engineering: Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk Away Collapse.

UNIT – IV
Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation. Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing

UNIT – V
Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

TEXTBOOKS:
1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

REFERENCE BOOKS:
1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabin's, 4e, Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

II Year B.Tech. EEE-I Sem

L	T	P	C
2	0	0	0

(20MC3BS02) QUANTITATIVE ANALYSIS-1

Course Objectives: The Students learn

1. To improve the problem-solving skills.
2. To enhance the employability skills among students to meet out the corporate expectations.
3. To enhance the student's interest towards industry expectations.
4. To prepare students for the campus recruitment program.
5. To produce the most competitive man power to fit in all scenario of the job market.

Course outcomes:

1. To Understand and Practice Simplifications.
2. To Understand and Practice the Problems on Ages.
3. To Understand and Practice the Quadratic Equations.
4. To Understand and Practice arrangement and selection in their daily life.
5. To Understand and Practice commercial mathematics.

UNIT-I

Numbers, H.C.F & L.C.M. of Numbers, Decimal Fractions & Simplifications.

UNIT-II

Square Roots & Cube Roots, Problems on Ages, Pipes & Cistern.

UNIT-III

Average, Time & Distance, Time & Work, Logarithm, Set Theory, Progressions, Quadratic Equations and Surds.

UNIT-IV

Permutation & Combination, Probability, Co-ordinate Geometry, Inequalities, Functions, Allegation& Mixtures, Number System.

UNIT-V

Partnership, Profit & Loss, Simple & Compound Interest, Percentage, Ratio & Proportion, Mensuration 2D & 3D.

TEXTBOOKS:

1. R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations.
2. R.S. Aggarwal, A Modern Approach to Logical Reasoning.

REFERENCE BOOKS:

1. Arun Sharma, Teach Yourself Quantitative Aptitude.
2. Rajesh Verma, Fast Track Objective Arithmetic.
3. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude For Competitive Examination.
4. Abhijit Gupta, Quantitative Aptitude for all Competitive Exam

II Year B.Tech. EEE-II Sem

L	T	P	C
3	1	0	4

(20EE5PC01) POWER ELECTRONICS

Course Objectives:

1. To Design/develop suitable power converter for efficient control or conversion of power in drive applications
2. To Design / develop suitable power converter for efficient transmission and utilization of power in power system applications

Course outcomes: After completion of this course the student is able to

1. Explain the operation of various power semiconductor devices its characteristics and commutation circuits.
2. Illustrate the operation of power converters with various loads.
3. Analyze the operation of AC voltage controllers.
4. Explain the operation of various types of choppers with different loads.
5. Discuss the operation of inverters and voltage control techniques.

UNIT – I

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

UNIT – II

Single Phase Half Wave Controlled Converters: Phase control technique - Single phase Line commutated converters - Half wave-controlled converters with Resistive, RL load and RLE load - Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Freewheeling Diode - Numerical problem

Single Phase Fully Controlled Converters: Fully controlled converters, Midpoint and Bridge connections with Resistive, RL loads and RLE load - Derivation of average load voltage and current – Line commutated inverters, semi-converters, active and Reactive power inputs to the converters, Effect of source inductance – Expressions of load voltage and current - Numerical problems

Three Phase Line Commutated Converters: Three phase converters - Three pulse and six pulse converters and bridge connections with R, RL load voltage and current with R and RL load and RLE loads - Semi Converters, Effect of Source inductance–Dual converters Waveforms - Numerical Problems

UNIT – III

AC Voltage Controllers:AC voltage controllers – Single phase two SCRs in anti-parallel with R and RL loads, modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor- wave forms, Numerical problems- Single phase and three phase cycloconverters (principle of operation only)

UNIT–IV

Choppers: Choppers – Time ratio control and Current limit control strategies – Step down choppers-Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression. Morgan's chopper – Jones chopper - Oscillation choppers (Principle of operation only) - waveforms — AC Chopper – Problems

UNIT–V

Inverters: Single phase inverter – Basic series inverter, parallel Capacitor inverter, bridge inverter – Waveforms, Simple bridge inverters, Voltage control techniques for inverters- Pulse width modulation techniques – Numerical problems.

TEXTBOOKS:

1. M. D. Singh & K. B. Kanchandhani, "Power Electronics", Tata McGraw – Hill Publishing Company, 1998.
2. "M. H. Rashid", "Power Electronics: Circuits, Devices and Applications", Prentice Hall of India, 2ndedition, 1998.
3. "V. R. Murthy", "Power Electronics", Oxford University Press, 1st Edition 2005.
4. P.S. Bimbhra, "Power Electronics", Khanna Publishers, 1st Edition 1997.

REFERENCE BOOKS:

1. VedamSubramanyam, "Power Electronics", New Age International (P) Limited, Publishers, 2nd Edition 2008.
2. Philip T. Krein, "Elements of Power Electronics", Oxford University Press, 1997.
3. M. S. Jamil Asghar, "Power Electronics", PHI Private Limited, 2004.
4. P. C. Sen, "Power Electronics", Tata McGraw-Hill Publishing, 2001.
5. John G. Kassakian, Martin, F. Schlect, Geroge C. Varghese, "Principles of Power Electronics", Pearson Education, 1st Edition 2010.
6. J.S Chitode, "Power Electronics", Technical Publication.

II Year B.Tech. EEE-II Sem

L	T	P	C
3	0	0	3

(20EE4PC02) DIGITAL ELECTRONICS

Prerequisite: Analog Electronics

Course Objectives:

1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems
2. To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations
3. To implement simple logical operations using combinational logic circuits
4. To design combinational logic circuits, sequential logic circuits.
5. To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
6. To implement synchronous state machines using flip-flops.

Course outcomes:

1. Apply the concept of Boolean algebra to simplify SOP and POS Boolean functions.
2. Construct combinational logical circuits using K-map method.
3. Analyse Counters and Register circuits using Flip Flops
4. Evaluate various Analog to Digital converters & Digital to Analog converters using OP-AMP.
5. Develop ROM and RAM using Programmable logic devices

UNIT – I

Fundament also Digital Systems: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes. LogicFamilies: characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

UNIT – II

Combinational Digital Circuits: Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial ladder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT – III

SequentialCircuitsand Systems: A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J, K, T and D types flip-flops, applications of flip-flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, applications of counters.

UNIT – IV

A/DandD/A Converters: Digital to analog converters: weighted resistor D/A converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs.

UNIT – V

SemiconductorMemoriesandProgramableLogicDevices: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

TEXTBOOKS:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCE BOOKS:

1. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-II Sem

L	T	P	C
3	1	0	4

(20EE4PC03) ELECTRICAL MACHINES-II

Course Objectives:

1. To deal with the detailed analysis of poly-phase induction motors & Alternators
2. To understand operation, construction and types of single-phase motors and their applications in household appliances and control systems.
3. To introduce the concept of parallel operation of alternators
4. To introduce the concept of regulation and its calculations
5. Gain Knowledge about the special machines.

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

1. Analyze the concepts of rotating magnetic fields.
2. Discuss the operation of induction machines.
3. Explain the Construction, Principle of operation, Characteristics & Regulation of Synchronous Generator
4. Analyze the operation of synchronous motors and its salient features.
5. Analyze the principle of operation of single-phase motors and special motors with applications

UNIT - I

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

UNIT - II

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

Speed Control Methods: Change of voltage, change of frequency, voltage/frequency, injection of an EMF into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

UNIT - III

Synchronous Machines: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics. Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of Xd and Xq (Slip test) Phasor diagrams – Regulation of salient pole alternators.

UNIT - IV

Parallel Operation of Synchronous Machines: Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactance's.

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

UNIT - V

Single Phase & Special Machines: Single phase induction motor – Constructional Features-Double revolving field theory – split-phase motors – shaded pole motor.

TEXTBOOKS:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

REFERENCE BOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.
5. U. A Bakshi &M.V. Bakshi "Electrical Machines-II", Technical Publications, 2007
6. U. A Bakshi&M.V. Bakshi "Electrical Machines-III", Technical Publications, 2009
7. Electric mechanics – III (Synchronous and single-phase machines), S. Kamakshaiah, Right Publishers
8. Principles of Electrical Machines, V.K. Mehta, Rohit Mehta, S. Ch and Publishers

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20MA4BS07) NUMERICAL METHODS AND COMPLEX VARIABLES

Course Objectives:

1. Various methods to the find roots of an equation.
2. Concept of finite differences and to estimate the value for the given data using interpolation.
3. Evaluation of integrals using numerical techniques
4. Solving ordinary differential equations using numerical techniques.
5. Differentiation and integration of complex valued functions.
6. Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
7. Expansion of complex functions using Taylor's and Laurent's series.

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

1. Estimate the value for the given data using interpolation.
2. Find the numerical solutions for a given ODE's.
3. Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
4. Apply Taylor's and Laurent's series expansions of complex Function.
5. Explain the transformations on different planes.

UNIT – I

Algebraic and Transcendental Equations: Introduction – Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method.

UNIT - II

Interpolation: Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation.

UNIT – III

Numerical Differentiation and integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods; Runge-Kutta method of fourth order.

UNIT - IV

Complex Differentiation: Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate**.**

UNIT - V

Complex Integration: Line integrals, Cauchy's theorem, Cauchy's Integral formula, Cauchy's Integral theorem, Liouville's theorem, Maximum-Modulus theorem (All theorems without proof); zeros of analytic functions, singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem (without proof). Bilinear Transformation, properties, cross ratio, fixed points.

TEXTBOOKS:

1. **B.S. Grewal**, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. **S.S. Sastry**, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

3. **B.V. Ramana**, Higher Engineering Mathematics- Tata McGraw Hill New Delhi- 11th Reprint- 2010.
4 **S.R.K. Iyengar and R.K. Jain,** Advanced Engineering Mathematics by – NarosaPublications

REFERENCE BOOKS:

1. **Erwin kreyszig**, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. **N.P. Bali and Manish Goyal**, A text book of engineering Mathematics- Laxmi Publications.
3. **Babu Ram**, Numerical methods, Pearson Education.**Michael Greenberg,** Advanced Engineering Mathematics, Second Edition, Pearson Education.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-II Sem

L	T	P	C
3	0	0	3

(20EE4PC05) POWER SYSTEM

Course Objectives:

1. To understand the different types of power generating stations.
2. To examine A.C. and D.C. distribution systems.
3. To understand and compare overhead line insulators and Insulated cables.
4. To illustrate the economic aspects of power generation and tariff methods.
5. To evaluate the transmission line parameters calculations
6. To understand the concept of corona

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

1. Interpret the concepts of power systems.
2. Explain the operation of conventional generating stations and renewable sources of electrical power.
3. Discuss about the different power tariff methods.
4. Determine the electrical circuit parameters of transmission lines
5. Sketch the layout of substation and underground cables and corona

UNIT – I

Generation of Electric Power

Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant. Non-Conventional Sources (Qualitative): Ocean Energy, Tidal Energy, Wave Energy, wind Energy, Fuel Cells, and Solar Energy, Cogeneration and energy conservation and storage.

UNIT - II

Economics of Generation: Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

UNIT – III

OverheadLineInsulators&InsulatedCables: Introduction, typesofinsulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators. Introduction, insulation, insulating materials, Extra high voltage cables, grading of cables, insulation resistance of a cable, Capacitance of a single core and three core cables, Overhead lines versus underground cables, types of cables

UNIT – IV

Inductance & Capacitance Calculations of Transmission Lines: Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors-transposition, bundled conductors, and effect of earth on capacitance.

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

UNIT – V

A.C. Distribution: Introduction, ACdistribution, Singlephase,3-phase,3phase4 wire system, busbar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in A.C.

Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.
DC Distribution: ClassificationofDistributionSystems. -ComparisonofDCvs.ACandUnder-Ground vs. Over-Head Distribution Systems. - Requirements and Design features of Distribution Systems. –VoltageDrop Calculations (Numerical Problems) inD.CDistributersforthefollowing cases: RadialD.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

TEXTBOOKS:

1. W.D. Stevenson –Elements of Power System Analysis, Fourth Edition, McGraw Hill,1984.
2. C.L. Wadhwa –Generation, Distribution and Utilization of Electrical Energy, Second Edition, New Age International,2009.
3. V. K. Mehta, Rohit Mehta-Principal of Power System

REFERENCE BOOKS:

1. C.L. Wadhwa –Electrical Power Systems, Fifth Edition, New Age International,2009
2. M.V. Deshpande–Elements of Electrical Power Station Design, Third Edition, Wheeler Pub.1998
3. H. Cotton&H. Barber-The Transmission and Distribution of Electrical Energy, Third "V.K Mehta and Rohit Mehta", "Principles of Power Systems", S. Chand& Company Ltd, New Delhi,2004

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-II Sem

L	**T**	**P**	**C**
0	**0**	**2**	**1**

(20EE4PC06) POWER ELECTRONICS LAB

Course Objectives:

1. Apply the concepts of power electronic converters for efficient conversion/control of power from source to load.
2. Design the power converter with suitable switches meeting a specific load requirement

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

1. Explain the operating principles of various power electronic converters.
2. Use power electronic simulation packages& hardware to develop the power converters.
3. Experiment the appropriate converters for various applications
4. Demonstrate the various inverter circuits.
5. Produce the output waveforms of chopper circuits

Any eight experiments should be conducted

1. Study of Characteristics of SCR, MOSFET & IGBT,
2. Gate firing circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase half controlled &fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E)
6. Single Phase Cyclo- converter with R and RL loads
7. Single Phase series& parallel inverter with R and RL loads
8. Single Phase Bridge inverter with R and RL load

Any two experiments should be conducted

1. DC Jones chopper with R and RL Loads
2. Three Phase half-controlled bridge converter with R-load
3. Single Phase dual converter with RL loads
4. a) Simulation of single-phase Half wave converter using R and RL loads

   b) Simulation of single-phase full converter using R, RL and RLE loads

   c) Simulation of single-phase Semi converter using R, RL and RLE load
5. a) Simulation of Single-phase AC voltage controller using R and RL loads

   b) Simulation of Single phase Cyclo-converter with R and RL-load
6. Simulation of Buck chopper
7. Simulation of single-phase Inverter with PWM control
8. Simulation of three phase fully controlled converter with R and RL loads, with and without freewheeling diode. Observation of waveforms for Continuous and Discontinuous modes of operation.
9. Study of PWM techniques.

REFERENCE BOOKS:

1. M. H. Rashid, Simulation of Electric and Electronic circuits using PSPICE – by M/s PHI Publications.
2. User's manual of related software's
3. Reference guides of related software's
4. Rashid, Spice for power electronics and electric power, CRC Pres

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

(20EE4PC07) DIGITAL ELECTRONICS LAB

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

1. Implement the logic gates using universal gates and verify the truth tables
2. Interpret the Boolean expression of SOP and POS using logic gates.
3. Construct combinational logical circuits (Adders, Sub tractors, Encoders, Multiplexers).
4. Evaluate the SR, D, T and JK Flip Flops with their truth tables.
5. Design Synchronous and Asynchronous Sequential logical circuits

List of Experiments:

1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of a 4-bit pseudo random sequence generator using logic gates.
7. Design and realization of an 8-bit parallel load and serial out shift register using flip-flops.
8. Design and realization a Synchronous and Asynchronous counters using flip-flops
9. Design and realization 8x1 using 2x1 mux
10. Design and realization 2-bit comparator
11. Verification of truth tables and excitation tables
12. Realization of logic gates using DTL, TTL, ECL, etc

Major Equipment's required for Laboratories:

1. DIGITAL TRAINER KITS
2. 20MHz, Dual channel Cathode Ray Oscilloscope
3. Function generator

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-II Sem

L	**T**	**P**	**C**
0	**0**	**2**	**1**

(20EE4PC08) ELECTRICAL MACHINES LAB

Course Objectives:

1. To understand the operation of synchronous machines
2. To understand the analysis of power angle curve of a synchronous machine
3. To understand the equivalent circuit of a single-phase transformer and single-phase induction motor
4. To understand the circle diagram of an induction motor by conducting a blocked rotor test
5. To understand the operation of synchronous machines

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

1. Calculate the performance of different machines using different testing methods
2. Demonstrate the performance of transformers.
3. Determine the V and inverted V curves of synchronous motor.
4. Discuss the active and reactive power flows in synchronous machines
5. Demonstrate different machines and control the speed and power factor

The following experiments are required to be conducted as compulsory experiments

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner's test on a pair of single-phase transformers
3. No-load & Blocked rotor tests on three phase Induction motor
4. Regulation of a three –phase alternator by synchronous impedance &m.m.f. methods
5. V and Inverted V curves of a three—phase synchronous motor.
6. Equivalent Circuit of a single-phase induction motor
7. Determination of Xd and Xq of a salient pole synchronous machine
8. Load test on three phase Induction Motor

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

1. Separation of core losses of a single-phase transformer
2. Efficiency of a three-phase alternator
3. Parallel operation of Single-phase Transformers
4. Regulation of three-phase alternator by Z.P.F. and A.S.A methods
5. Heat run test on a bank of 3 Nos. of single-phase Delta connected transformers
6. Measurement of sequence impedance of a three-phase alternator.
7. Vector grouping of Three Transformer
8. Scott Connection of transformer

TEXTBOOKS:

1. A.E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

REFERENCE BOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984
4. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	2	**0**	**0**	**0**

(20MC4HS03) GENDER SENSITIZATION LAB

Course Description

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmers combating gender- based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Course Objectives:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

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

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.
6. Students will develop a sense of appreciation of women in all walks of life.
7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT - I

Understanding Gender: Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men, Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT - II

Gender Roles and Relations: Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex

Selection and Its Consequences Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary.

UNIT - III

Gender and Labor

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

UNIT - IV

Gender - Based Violence

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim- "I Fought for my Life…."

UNIT - V

Gender and Culture: Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular. Literature - Just Relationships: Being Together as Equals.

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks- The Brave Heart.

TEXTBOOKS: "Towards a World of Equals: A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	2	**0**	**0**	**0**

(20MC4HS10) QUANTITATIVE LOGICAL AND REASONING

Course Objectives: To learn

1. To improve the Logical Ability and Reasoning skills among the students to meet the expectations of Industry.
2. To counsel the students to improve their career exposure across the industry
3. To improve the Data Sequences & Calendars problems.
4. To enhance Non-Verbal Reasoning among the students as per the industry requirements
5. To improve the graphical representation skills among the students.

Course Outcomes: The Students able

1. To understand and practice logical reasoning
2. To understand and practice the different classifications
3. To understand and practice different Sitting Arrangements, Data Sequences.
4. To understand and practice the Non-Verbal Reasoning.
5. To understand and practice the graphs.

UNIT-I

Coding Decoding, Directions, Blood Relations & Alphabet Test.

UNIT-II

Statements & Arguments, Analogy Classification & Clocks.

UNIT-III

Sitting Arrangements, Data Sequences & Calendars and Syllogism.

UNIT-IV

Puzzle Test, Non-Verbal Reasoning, Cubs & Dice.

UNIT-V

Tabulation, Bar Graphs, Pie Charts and Line Graphs.

TEXTBOOKS:

1. R.S. Aggarwal, A Modern Approach to Logical Reasoning.
2. R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning.

REFERENCE BOOKS:

1. R.V. Praveen, Quantitative Aptitude and Reasoning.
2. Praxis groups, Campus Recruitment Complete Reference.
3. BS Sijwalii& Indu Sijwali, A New Approach to Reasoning Verbal, Non-Verbal & Analytical.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

(20EE5PC01) CONTROL SYSTEM

Course Outcomes: At the end of the course, the student should be able to

1. Discuss the fundamentals of classical and modern control systems.
2. Explain various electrical and mechanical systems.
3. Sketch time and frequency responses of first and second-order systems.
4. Analyze stability of control systems.
5. Analyze the linear discrete time system in State space

UNIT-I

INTRODUCTION

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback.

Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

UNIT II

TRANSFER FUNCTION REPRESENTATION

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

UNIT III

TIME RESPONSE AND STABILITY ANALYSIS

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

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.

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

UNIT IV

FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode Diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin Stability Analysis from Bode Plots, Nyquist Plots-Stability Analysis.

UNIT-V

CLASSICAL CONTROL DESIGN TECHNIQUES AND STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Introduction to Compensation techniques, PID Controllers. Concepts of state, state variables and state model, derivation of state models - Solving the Time invariant state Equations - State Transition Matrix and its Properties, Concepts of Controllability and Observability.

TEXTBOOKS:

1. Control Systems Engineering, I.J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers-2nd Edition.
2. Automatic Control Systems, B. C. Kuo, John wiley and sons-8thEdition

REFERENCE BOOKS:

1. Control Systems, Nagoorkani-2ndEdition.
2. Control Systems, N.C. Jagan, BS Publications-2ndEdition.
3. Modern Control Engineering, Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd.-3rdEdition

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE5PC02): POWER SYSTEM – II

Course Objectives:

1. To understand the performance of transmission lines.
2. To understand the voltage control and compensation methods.
3. To understand the per unit representation of power systems.
4. To examine the performance of travelling waves.
5. To know the methods of overvoltage protection and Insulation coordination of transmission Lines
6. To know the symmetrical components and fault calculation analysis

Course Outcomes: At the end of the course, the student should be able to

1. Calculate the performance of transmission lines
2. Apply load compensation techniques to control reactive power.
3. Interpret the application of per unit quantities and transient's phenomenon of transmission lines.
4. Discuss overvoltage protection and Insulation coordination of transmission Lines
5. Compute the fault currents for symmetrical and unsymmetrical faults.

UNIT-I

Performance of Lines: Representation of lines, short transmission lines, medium length lines, nominal T and PI- representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C, D constants, Skin Effect, Proximity Effect and Ferranti Effect, Power flow through a transmission line, receiving end power circle diagram.

UNIT-II

Voltage Control: Introduction – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers.

Compensation In Power Systems: Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

UNIT-III

Per Unit Representation of Power Systems: The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages of per unit system.

Travelling Waves on Transmission Lines: Production of travelling waves, open circuited line, short circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at T-junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation of travelling waves.

UNIT-IV

Overvoltage Protection and Insulation Coordination: Over voltage due to arcing ground and Peterson coil, lightning, horn gaps, surge diverters, rod gaps, expulsion type lightning arrester, valve type lightning arrester, ground wires, ground rods, counter poise, surge absorbers, insulation coordination, volt-time curves.

UNIT-V

Symmetrical Components and Fault Calculations: Significance of positive, negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedances and sequence networks, fault calculations, sequence network equations, single line to ground fault, line to line fault, double line to ground fault, three phase fault, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

TEXTBOOKS:

1. John J. Grainger & W.D. Stevenson: Power System Analysis – McGraw Hill International 1994.
2. C.L. Wadhwa: Electrical Power Systems – New Age International Pub. Co. Third Edition, 2001.
3. "M. A. Pai", "Computer Techniques in Power System Analysis", TMH Publications, 3rd Edition 2014.

REFERENCE BOOKS:

1. Hadi Sadat: Power System Analysis – Tata McGraw Hill Pub. Co. 2002
2. W.D. Stevenson: Elements of Power system Analysis – McGraw Hill International Student Edition
3. D.P. Kothari and I. J. Nagrath, Modern Power System Analysis - Tata McGraw Hill Pub. Co., New Delhi, Fourth edition, 2011

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE5PC03) MEASUREMENTS AND INSTRUMENTATION

Course Objectives:

1. To introduce the basic principles of all measuring instruments
2. To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.
3. To enable the students to think in terms of innovative ideas to improve the existing technology in the field of measurements in terms of accuracy, cost, durability and user friendliness.

Course Outcomes

1. Explain different types of measuring instruments, their construction, operation and characteristics
2. Choose the instruments suitable for typical measurements.
3. Analyze the concept of electrical power and energy measurement.
4. Calculate error, estimate correction factor and calibrate the instrument transformers.
5. Analyze the working of various DC and AC bridges.
6. Apply the knowledge about transducers and instrument transformers to use them effectively.

UNIT – I

Introduction to 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 shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type – extension of range of E.S. Voltmeters

UNIT – II

Potentiometers & Instrument transformers:

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization – applications. CT and PT – Ratio and phase angle errors

UNIT – III

Measurement of Power & Energy:

Single phase dynamometer wattmeter, LPF and UPF, Double element and three elements dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers Measurementofactive and reactive powersin balance dandun balanced systems.

single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using R.S.S. meter. Three phase energy meter – tri-vector meter, maximum demand meters.

UNIT – IV

DC & AC bridges:

Method of measuring low, medium and high resistance – sensitivity of Wheat-stone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method. Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle –Disunity's Bridge - Wien's bridge – Schering Bridge.

UNIT - V

Transducers:

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principal operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, and photodiodes.

TEXTBOOKS:

1. "G. K. Banerjee", "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition,2016
2. "S. C. Bhargava", "Electrical Measuring Instruments and Measurements", BS Publications,2012.

REFERENCE BOOKS:

1. "A. K. Sawhney", "Electrical & Electronic Measurement & Instruments", Dhanpat Rai& Co. Publications,2005.
2. "R. K. Rajput", "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd.,2007.
3. "Buckingham and Price", "Electrical Measurements", Prentice –Hall, 1988.
4. "Reissl and, M.U", "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.
5. "E.W. Golding and F. C. Widdis", "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing,2011.
6. Industrial Instrumentation and Control, 3rd ed. by S K Singh.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem

L	T	P	C
3	0	0	3

(20MS5HS03) BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

Course Objectives: To learn the basic Business types, impact of the Economy on Business and Firms Specifically. To analyze the Businessfromthe FinancialPerspective.

Course Outcomes

1. Comprehend the microeconomic factors in related to demand analysis and its forecasting.
2. Apply the theory of production function and Cost concepts to determine the Break-Even Analysis.
3. Gain knowledge of different market structures, pricing strategies and different forms business organization.
4. Study and analyze the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts
5. Learn Fundamental accounting concepts and Ratio analysis

UNIT - I

Introduction to Business and Economics Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance. Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II

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

UNIT – III

Production, Cost, Market Structures & Pricing Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and long run Cost Functions.
Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT – IV

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

UNIT – V

Financial Analysis through Ratios: Concept of Ratio Analysis, Importance, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXTBOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. 2.S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

20EN5HS04: ADVANCED COMMUNICATION SKILLS LAB

Course Objectives: This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
2. Further, they would be required to communicate their ideas relevantly and coherently in writing.
3. To prepare all the students for their placements.

Course outcomes: Students should be able to

1. Develop LSRW skills and soft skills.
2. Demonstrate the nuances of language through group activities and oral presentations.
3. Build written communication skills to meet the needs of their academic and career endeavors.
4. Take part in interviews with confidence thereby enhancing their employability skills.
5. Choose appropriate language in their social and professional communication.

UNIT – I

Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

UNIT – II

General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.

UNIT - III

Activities on Writing Skills – Subject-Verb Agreement, Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.

UNIT - IV

Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ emails/assignments etc.

UNIT – V

Activities on Group Discussion and Interview Skills – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

(20EE5PC06) MEASUREMENTS AND INSTRUMENTATION LAB

Course Objectives:

1. To calibrate LPF Watt Meter, energy meter, P.F Meter using electrodynamometer type instrument as the standard instrument
2. To determine unknown inductance, resistance, capacitance by performing experiments on D.C Bridges & A.C Bridges
3. To determine three phase active & reactive powers using single wattmeter method practically
4. To determine the ratio and phase angle errors of current transformer and potential transformer

Course outcomes: After completion of this lab the student is able to

1. Experiment on Energy meter & PF meter
2. Calculate the parameters by using various bridges.
3. Find the accuracy of any instrument by performing experiment
4. Calibrate PMMC instrument using D.C potentiometer
5. Perform experiment to calibrate the instruments.
6. Apply the transducers for various applications.

The following experiments are required to be conducted as compulsory experiments

1. Calibration and testing of single-phase energy Meter.
2. Calibration of dynamometer power factor meter.
3. Crompton D.C. Potentiometer–Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge–Measurement of resistance–Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3-Phase reactive power with single-phase wattmeter.
8. Measurement of displacement with the help of LVDT.

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

1. Calibration LPF wattmeter–by Phantom testing.
2. Measurement of 3-phase power with single wattmeter and two CTs.
3. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given
4. CT by Null method.
5. PT testing by comparison**–**V.G.as Null detector –Measurement of % ratio error and phase angle of the given PT
6. Resistance strain gauge–strain measurements and Calibration.
7. Transformer turns ratio measurement using AC bridges.
8. Measurement of % ratio error and phase angle of given CT by comparison.

TEXTBOOKS:

1. "G. K. Banerjee", "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd.,2nd Edition,2016
2. "S.C. Bhargava", "Electrical Measuring Instruments and Measurements Publications,2012.

REFERENCE BOOKS:

1. A.K. Sawhney", "Electrical& Electronic Measurement & Instruments", Dhanpat Rai& Co. Publications, 2005.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem

L	T	P	C
0	0	2	1

(20EE5PC07) CONTROL SYSTEMS LAB

Course Objectives:

1. To calibrate LPF Watt Meter, energy meter, P.F Meter using electrodynamometer type instrument as the standard instrument
2. To determine unknown inductance, resistance, capacitance by performing experiments on D.C Bridges & A.C Bridges
3. To determine three phase active & reactive powers using single wattmeter method practically
4. To determine the ratio and phase angle errors of current transformer and potential transformer

Course outcomes: After completion of this lab the student is able to

1. Experiment on Energy meter & PF meter
2. Calculate the parameters by using various bridges.
3. Find the accuracy of any instrument by performing experiment
4. Calibrate PMMC instrument using D.C potentiometer
5. Perform experiment to calibrate the instruments.
6. Apply the transducers for various applications.

The following experiments are required to be conducted compulsory experiments

1. Time response of Second order system
2. Characteristics of Synchro's
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions, and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC motor
6. Transfer function of DC generator
7. Temperature controller using PID
8. Characteristics of AC servo motor

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

1. 1.Effect of P, PD, PI, PID Controller on a second order systems
2. Lag and lead compensation – Magnitude and phase plot
3. (a) Simulation of P, PI, PID Controller.
4. (b) Linear system analysis (Time domain analysis, Error analysis) using suitable software
5. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using suitable software
6. State space model for classical transfer function using suitable software -Verification.
7. 7. Design of Lead-Lag compensator for the given system and with specification using suitable software

TEXTBOOKS:

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.

REFERENCE BOOKS:

1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

(20EE5PC08) POWER SYSTEM SIMULATION LAB

Course Objectives:

1. To perform voltage distributions across insulator strings
2. To understand the high frequency transients
3. To perform parameter estimation and fault analysis on Transmission lines
4. To calculate Time constant calculations
5. To perform Tariff Estimation
6. To perform resonance circuit simulation

Course outcomes: After completion of this lab the student is able to

1. Analyze the voltage distribution across insulator string
2. Perform various transmission line calculations
3. Interpret different circuits time constants
4. Perform the resonant circuit in MATLAB/SIMULINK
5. Analyze the experimental data and draw the conclusions**.**

List of Experiments:

1. Generation of high frequency transients through RLC circuit
2. Voltage distribution across insulator string
3. Comparison of lumped and distributed transmission lines
4. Calculation of fault currents of transmission line
5. Time constant calculation of RL circuit
6. Time constant calculation of RC circuit
7. Time constant calculation of RLC circuit
8. Simulation of Resonance circuit
9. Calculation of R, L, C, Zs of 3-phase Transmission Line
10. Estimation of TARIFF based on load curve

NOTE: The above experiments shall be conducted using any software tool

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**0**

(20MC5HS05) INTELLECTUAL PROPERTY RIGHTS

UNIT I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT-IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

UNIT V

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law

TEXTBOOKS&REFERENCE BOOKS:

1. Intellectual property right, Deborah. E. Bou choux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, Prabuddha Ganguli, Tata McGraw Hill Publishing company ltd

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem

L	T	P	C
2	0	0	0

(20MC5HS06) PERSONALITY DEVELOPMENT & SOFT SKILLS

Course Objectives:

1. Projecting the Right First Impression
2. Polishing manners to behave appropriately in social and professional circles
3. Enhancing the ability to handle casual and formal situations in terms of personal grooming, dining and entertaining etiquette
4. Developing and maintaining a positive attitude and being assertive
5. Mastering Cross Cultural Etiquette
6. Handling difficult situations with grace, style, and professionalism
7. To understand the importance of oral & written Communication Skills in Corporate Sector.

Course outcomes:

1. Students will possess the personality development techniques and communication skills.
2. Students will possess knowledge about leadership.
3. Students will be able to acquire the skills to manage stress and conflict.
4. Students will able to acquire Problem Solving & Critical Thinking.
5. Students will able to acquire different resume preparation & Essay Writing Techniques**.**

UNIT I

Personality Development Body Language: Professional and Casual attire, Public Speaking, Strengths & Weakness, Organizational Skills, Self-Assessment**.**

UNIT II

Goal Setting: Time Management, Stress Management, Career Management, Confidence / Motivation, Tolerance of Change and Uncertainty

UNIT III

Soft Skills Grammar: Noun, Pronoun, Adjectives, Tenses, Verb, Subject + Verb, Agreement, Adverb, Preposition, Article, Conjunction.
Vocabulary: Synonyms & Antonyms, Words often Confused & Misused
Verbal Ability: Sentence Improvement, Reading Comprehension, Cloze Test, Sentence Rearrangements, Fill in the Blanks, Theme Detection Analogy

UNIT IV

Just A Minute (JAM), Group Discussion (GD), Debate, Role Play, Cognitive Skills, Leadership Qualities, Work Ethics, Problem Solving & Adaptability, Critical Thinking, Random Words, and Interview Skills: Tell me about yourself.

UNIT V

Team Work, Self-Awareness and Presentation Skills, Resume Building: Normal Resume Preparation, Video Resume & Career Specific Resume, Email Etiquette, Essay Writing.

TEXTBOOKS:

1. Personality Development and Soft Skills - Barun K. Mitra
2. Personality Development and Soft Skills: Preparing for Tomorrow - Shikha Kapoor
3. Soft Skills Personality Development for Life Success – Prashanth Sharma.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE6PC01) POWER SYSTEM OPERATION AND CONTROL

Course Objectives:

1. To understand real power control and operation
2. To know the importance of frequency control
3. To analyse different methods to control reactive power
4. To understand unit commitment problem and importance of economic load dispatch
5. To understand real time control of power systems

Course outcomes: At the end of the course the student will be able to

1. Explain the concept of different load flow techniques.
2. Calculate the economic load dispatch scheduling of various power stations.
3. Apply the different Load frequency control techniques
4. Illustrate and improve the power system stability
5. Interpret the concept of SCADA, EMS and load forecasting techniques.

UNIT I

Load Flow Studies

Introduction, Bus classification -Nodal admittance matrix - Load flow equations - Iterative methods - Gauss and Gauss Seidel Methods, Newton-Raphson Method-Fast Decoupled Method-Merits and demerits of the above methods-System data for load flow study

UNIT II

Economic Operation of Power Systems

Distribution of load between units within a plant-Transmission loss as a function of plant generation, Calculation of loss coefficients-Distribution of load between plants.

UNIT III

Load Frequency Control

Introduction, load frequency problem-Megawatt frequency (or P-f) control channel, MVAR voltages (or Q-V) control channel-Dynamic interaction between P-f and Q-V loops. Mathematical model of speed governing system-Turbine models, division of power system into control areas, P-f control of single control area (the uncontrolled and controlled cases)-P-f control of two area systems (the uncontrolled cases and controlled cases)

UNIT IV

Power System Stability

The stability problem-Steady state stability, transient stability and Dynamic Stability-Swing equation. Equal area criterion of stability-Applications of Equal area criterion, Step by step solution of swing equation-Factors affecting transient stability, Methods to improve steady state and Transient stability, Introduction to voltage stability

UNIT V

Computer Control of Power Systems

Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration – SCADA and EMS functions. Network topology – Importance of Load Forecasting and simple techniques of forecasting.

TEXTBOOKS:

1. C. L. Wadhwa, Electrical Power Systems, 3rd Edn, New Age International Publishing Co., 2001.
2. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th Edn, Tata McGraw Hill
3. Soft Skills Personality Development for Life Success – Prashanth Sharma.

REFERENCE BOOKS: `

1. D. P. Kothari: Modern Power System Analysis-Tata McGraw Hill Pub. Co. 2003.
2. Hadi Sadat: Power System Analysis –Tata McGraw Hill Pub. Co. 2002.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-II Sem

L	T	P	C
3	0	0	0

(20EE6PC02) MICROPROCESSOR AND MICROCONTROLLE

Course Objectives:

1. To familiarize the architecture of microprocessors and microcontrollers
2. To provide the knowledge about in terracing techniques of bus memory.
3. To under and the concepts of ARM architecture
4. To study the basic concepts of Advanced ARM processors

Course outcomes: Uponcompletingthiscourse, thestudentwillbeableto

1. Apply the concept of addressing modes and data transfer instructions of 8086 microprocessors for Arithmetic and Logical Unit Operation.
2. Analyze the concepts of internal architecture, organization of 8051 to solve real time applications.
3. Analyze various interfacing devices with 8051 microcontrollers.
4. Evaluate simple programs using Assembly Language Program of ARM and their instruction formats.
5. Explain the architecture of Advanced ARM Processors.

UNIT I

8086Architecture:8086Architecture-Functionaldiagram, RegisterOrganization, MemorySegmentation, Programming Model, Memory addresses, Physical Memory Organization, Architectureof8086, Signal descriptionsof8086, interruptsof8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, addressingmodes, Instruction Set, Assemblerreceives, Macros, and Simple Program involvingLogical, Branch andCall Instructions, Sorting, String Manipulations.

UNIT II:

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, MemoryOrganization, Addressing Modesand Instructionsetof8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts,
ProgrammingtheSerial CommunicationInterrupts, Programming8051TimersandCounters

UNIT- III:

I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DACInterface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External CommunicationInterfaces-RS232, USB.

UNIT- IV:

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector tableARMinstriction set–Data processing, Branch instructions, loadstoreinstructions, Softwareinterrupt instructions, Programstatus registerinstriations, loading constants, Conditional execution, Introduction to Thumb instructions.

UNIT-V AdvancedARMProcessors: IntroductiontoCORTEXProcessoranditsarchitecture, OMAPProcessorand its Architecture

TEXTBOOKS:

1. Advanced Microprocessors and Peripherals–A.K. Rayand K.M. Khubchandani, TMH,2nd Edition2006.
2. The 8051Microcontroller, Kenneth. Ayala, CengageLearning,3rd Ed,2004
3. ARM System Developers guide, Andrew NSLOSS, Dominic SYMES, Chris WRIGHT, Elsevier,2012.

REFERENCE BOOKS: `

1. Microprocessors and Interfacing, D.V. Hall, TMGH,2ndEdition2006.
2. The8051Microcontrollers, Architecture and Programming an Applications-K. Uma Rao, Andhe Pallavi, Pearson,2009.
3. Digital Signal Processing and Applications withtheOMAP-L138Experimenter, Donald Reay, WILEY

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE6PC03): POWER SYSTEM PROTECTION

Course Objectives:

1. To introduce all kinds of circuit breakers and relays for protection of Generators, Transformers and feeder bus bars from Over voltages and other hazards.
2. To describe neutral grounding for overall protection.
3. To understand the phenomenon of Over Voltages and its classification.

Course outcomes: At the end of the course the student will be able to:

1. Analyze electromagnetic, static and microprocessor-based relays
2. Apply technology to protect power system components.
3. Calculate relay settings of over current and distance relays.
4. Analyze quenching mechanisms used in air, oil and vacuum circuit breakers
5. Prepare the importance of different types of relays.
6. Explain the different schemes used in apparatus protection.

UNIT-I: **Protective Relays**

Introduction, Need for power system protection, effects of faults, evolution of protective relays, zones of protection, primary and backup protection, essential qualities of protection, classification of protective relays and schemes, current transformers, potential transformers, basic relay terminology.
Operating Principles and Relay Construction: Electromagnetic relays, thermal relays, static relays, microprocessor based protective relays.

UNIT-II: Over-Current Protection

Time-current characteristics, current setting, over current protective schemes, directional relay, protection of parallel feeders, protection of ring mains, Phase fault and earth fault protection, Combined earth fault and phase fault protective scheme, Directional earth fault relay.
Distance Protection: Impedance relay, reactance relay, MHO relay, input quantities for various types of distance relays, Effect of arc resistance, Effect of power swings, effect of line length and source impedance on the performance of distance relays, selection of distance relays, MHO relay with blinders, Reduction of measuring units, switched distance schemes, auto re-closing.

UNIT-III: Pilot Relaying Schemes

Wire Pilot protection, Carrier current protection. AC Machines and Bus Zone Protection: Protection of Generators, Protection of transformers, Bus-zone protection, frame leakage protection.

UNIT – IV: Static Relays

Amplitude and Phase comparators, Duality between AC and PC, Static amplitude comparator, integrating and instantaneous comparators, static phase comparators, coincidence type of phase comparator, static over current relays, static directional relay, static differential relay, static distance relays, Multi input comparators, concept of Quadrilateral and Elliptical relay characteristics.
Microprocessor Based Relays: Advantages, over current relays, directional relays, distance relays.

UNIT – V: Circuit Breakers

Introduction, arcing in circuit breakers, arc interruption theories, re-striking and recovery voltage, resistance switching, current chopping, interruption of capacitive current, oil circuit breaker, air blast circuit breakers, SF6 circuit breaker, operating mechanism, selection of circuit breakers, high voltage decreases, ratings of circuit breakers, testing of circuit breakers.
FUSES: Introduction, fuse characteristics, types of fuses, application of HRC fuses, discrimination.

TEXTBOOKS:

1. Badri ram and D.N. Vishwakarma, Power System Protection and Switchgear, TMH 2001.
2. U. A. Bakshi, M.V. Bakshi: Switchgear and Protection, Technical Publications,2009.

REFERENCE BOOKS: `

1. C. Russel Mason– "The art and science of protective relaying, Wiley Eastern,1995
2. L.P. Singh "Protective relaying from Electro mechanical to Microprocessors", New Age International

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-II Sem

L	T	P	C
3	0	0	3

(20EE6PC04) POWER SEMICONDUCTOR DRIVES

Prerequisite: Power Electronics, Electrical Machines – I, Electrical Machines – II

Course Objectives:

1. To introduce the drive system and operating modes of drive and its characteristics
2. To understand Speed – Torque characteristics of different motor drives by various power
3. converter topologies
4. To appreciate the motoring and braking operations of drive
5. To differentiate DC and AC drives

Course outcomes: After completion of this course the student is able to

1. Prepare the drawbacks of speed control of motor by conventional methods.
2. Analyse Phase controlled and chopper-controlled DC drives speed-torque characteristics, merits and demerits
3. Analyse AC motor drive speed–torque characteristics using different control strategies its merits and demerits
4. Use of Slip power recovery schemes
5. Illustrate the different types of control mechanism in synchronous motors.

UNIT I

Control of DC Motors

Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected tod.c separately excited and d.c series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed d.c motors.

Three phase semi and fully controlled converters connected to d.c separately excited and d.c series motors – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – Problems.

UNIT II:

Four Quadrant Operation of DC Drives

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

Control of DC Motors By Choppers: Single quadrant, two quadrant and four quadrant choppers fed dc separately excited and series motors – Continuous current operation – Output voltage and current wave forms – Speed and torque expressions – speed-torque characteristics – Problems on Chopper fed D.C Motors – Closed Loop operation (Block Diagram Only)

UNITIII:

Control of Induction Motor

Variable voltage characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms – speed torque characteristics.

Variable frequency characteristics-Variable frequency control of induction motor by Voltage source and current source inverter and cyclo-converters- PWM control – Comparison of VSI and CSI operations – Speed torque characteristics – numerical problems on induction motor drives – Closed loop operation of induction motor drives (Block Diagram Only)

UNIT IV:

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.

UNIT V:

Control of Synchronous Motors

Separate control and self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI, CSI and cyclo- converters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control - Cyclo-converter, PWM based VSI & CSI.

TEXTBOOKS:

1. G K Dubey", Fundamentals of Electric Drives, CRC Press, 2002.
2. "VedamSubramanyam", Thyristor Control of Electric drives, Tata McGraw Hill Publications

REFERENCE BOOKS: `

1. "S K Pillai", A First course on Electrical Drives, New Age International (P) Ltd. 2nd Edition. 1989
2. "P. C. Sen", Thyristor DC Drives, Wiley-Blackwell, 1981
3. "B. K. Bose", Modern Power Electronics, and AC Drives, Pearson 2015.
4. "R. Krishnan", Electric motor drives - modelling, Analysis and control, Prentice Hall PTR, 2001

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-II Sem

L	**T**	**P**	**C**
0	**0**	**2**	**1**

(20EE6PC05) MICROPROCESSOR & MICROCONTROLLERS LAB

Course Objectives:

1. T of familiarize the architecture of microprocessors and microcontrollers
2. To develop assembly level language programming on microcontroller-based system.
3. To provide the knowledge geobotanies facing techniques of bus memory.

Course outcomes: Uponcompletingthiscourse, thestudentwillbeableto

1. Demonstrate the concept of addressing in 8086 for arithmetic, logical, string and bit level operations.
2. Experiment the concept of arithmetic, logical, bit manipulation and branching instructions using 8051 microcontrollers.
3. Analyse the serial and parallel communication in 8051 Microcontroller.
4. Design the given system using interrupt controller in 8051 microcontrollers.
5. Build 8051 microcontroller with input and output devices.

Cycle1: Using 8086ProcessorKitsand/or Assembler(5Weeks)

Assembly Language Programs to 8086to Perform

1. Arithmetic, Logical, String Operations on 16 Bitand32-BitData.
2. BilevelLogicalOperations, Rotate, ShiftSwapandBranchOperations**.**

Cycle2:Using8051MicrocontrollerKit(6weeks)

Introduction toIDE

1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 BitData Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swapand Branch Instructions
2. TimedelayGenerationUsingTimersof8051.
3. SerialCommunicationfrom /to8051to/fromI/Odevices.
4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 UsingTimer08051in8bitAutoreloadModeandConnecta1HZPulsetoINT1pinandDisplayonPort0. Assume Crystal Frequencyas11.0592MHZ

Cycle3: InterfacingI/O Devices to 8051(5Weeks)

1. 7SegmentDisplayto8051.
2. Matrix Keypadto8051.
3. Sequence Generator UsingSerialInterfacein8051.
4. 8 bitADCInterfaceto8051.
5. TriangularWaveGeneratorthroughDACinterfacesto8051

TEXTBOOKS:

1. Advanced Microprocessors and Peripherals by AK Ray, TataMcGraw-HillEducation,2006
2. The8051Microcontrollers: Architecture, Programming &Applications by Dr.K. Uma Rao, And he

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-II Sem

L	T	P	C
0	0	2	1

(20EE6PC06) POWER SYSTEM LAB

Course Objectives:

1. To understand the Load flow analysis
2. To perform different protection relays
3. To find sequence impedancesof3-Φsynchronous machine and Transformer
4. To Preformulatealysison Transmission line mode sand Generators**.**

Course outcomes: After completionofthislab, thestudentwillbeableto

1. Perform various load flow techniques
2. Explain Different protection methods
3. Determine A, B, C, D constants of a Transmission line
4. Observe the sequence impedances of three phase transformer and synchronous machines.
5. Analyze the Impedance and Admittance matrices
6. Analyze the experimental data and draw the conclusions**.**

The following experiments are required to be conducted as compulsory experiments:
Part-A

1. CharacteristicsofIDMTOver-Current Relay.
2. Differentialprotectionof1-Φtransformer.
3. Characteristics of MicroProcessor based Over voltage/Undervoltage relay.
4. A, B, C, Dconstants ofaLongTransmissionline
5. Finding the sequence impedances of 3-Φ synchronous machine.
6. Finding the sequence impedances of 3-Φ Transformer.

In addition to the above six experiments, at least any four of the experiments from the Following list are required to be conducted.

Part – B

1. Formation of YBUS.
2. Load Flow Analysis using Gauss Seidel (GS) Method.
3. Load Flow Analysis using Fast Decoupled (FD) Method.
4. Formation of ZBUS.
5. Simulation of Compensated Line

TEXTBOOKS:

1. C.L. Wadhwa: Electrical Power Systems –Third Edition, New Age International Pub. Co., 2001.
2. Hadi Sadat: Power System Analysis –Tata McGraw Hill Pub. Co. 2002.

REFERENCE BOOK:

1. D. P. Kothari: Modern Power System Analysis-Tata McGraw Hill Pub. Co. 2003

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

(20EE6PC07) ELECTRICAL WORKSHOP LAB

Course Objectives:

1. To enhance practical knowledge related to different subjects
2. To develop hardware skills such as soldering, winding etc.
3. To develop debugging skills
4. To increase ability for analysis and testing of circuits.
5. To give an exposure to market survey for available components
6. To develop an ability for proper documentation of experimentation.
7. To enhance employability of a student.
8. To prepare students for working on different hardware projects

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

1. Get practical knowledge related to electrical systems
2. Fabricate basic electrical circuit elements/networks
3. Trouble shoot the electrical circuits
4. Design filter circuit for application
5. Get hardware skills such as soldering, winding etc
6. Get debugging skills.

Group -A

1. Design and fabrication of reactor/ electromagnet for different inductance values
2. Design and fabrication of single-phase Induction motor stator
3. Start delta starter wiring for automatic and manual operation
4. Wiring of distribution box with MCB, RCCB and MCCB
5. Wiring of 40 W tube, T-5, LED, Metal Halide lamps and available latest luminaries
6. Assembly of various types of contactors with wiring.
7. Assembly of DOL and 3-point starter with NVC connections and overload operation.

In addition to the above six experiments, at least any four of the experiments from the

Following list are required to be conducted.

G**roup B: This group consists of electronic circuits which must be assembled and tested on general Purpose PCB or bread boards.**

1. Design and development of 5 V regulated power supply
2. Design and development of precision rectifier.
3. Design and development of first order/ second order low pass/high pass filters with an application.
4. Microcontroller Interface circuit for temperature/current/voltage measurement.
5. Peak detector using op-amplifiers
6. Zero crossing detector using op-amplifiers.
7. PCB design and layout

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem

L	T	P	C
3	0	0	1

(20EE5PE11) MODERN POWER ELECTRONICS
(Professional Elective-1)

Course Objectives:

1. To understand various Power Electronics devices such as SCR, TRIAC, DIAC, IGBT, GTO etc.
2. To understand application of aforesaid Power Electronics devices in Choppers, Inverters and Converters etc.
3. To understand control of Electrical Motors through DC-DC converters, AC Converters etc.
4. To understand the use of Inductors and Capacitors in Choppers, Inverters and Converters.

Course outcomes: Students are able to

1. Demonstrate various Power Electronics devices such as SCR, TRIAC, DIAC, IGBT, GTO etc.
2. Use application of aforesaid Power Electronics devices in Choppers, Inverters and Converters etc.
3. Apply control of Electrical Motors through DC-DC converters, AC Converters etc.
4. Use of Inductors and Capacitors in Choppers, Inverters and Converters.
5. Describe the operation of resonant converters, power conditioners & UPS.

UNIT - I

High-Power Semiconductor Devices: Introduction, High-Power Switching Devices, Diodes, Silicon-Controlled Rectifier (SCR), Gate Turn-Off (GTO) Thyristor, Gate-Commutated Thyristor (GCT), Insulated Gate Bipolar Transistor (IGBT), Other Switching Devices, Operation of Series-Connected Devices, Main Causes of Voltage Unbalance, Voltage Equalization for GCTs,

UNIT-II

Cascaded H-Bridge Multilevel Inverters: Introduction, Sinusoidal PWM, Modulation Scheme, Harmonic Content, over modulation, Third Harmonic Injection PWM, Space Vector Modulation, Switching States, Space Vectors, Dwell Time Calculation, Modulation Index, Switching Sequence, Spectrum Analysis, Even-Order Harmonic Elimination, Discontinuous Space Vector Modulation.
Introduction, H-Bridge Inverter, Bipolar Pulse-Width Modulation, Unipolar Pulse-Width Modulation.

UNIT - III

Diode-Clamped Multilevel Inverters: Three-Level Inverter, Converter Configuration, Switching State ,Commutation, Space Vector Modulation, Stationary Space Vectors , Dwell Time Calculation, Relationship Between Relocation and Dwell Times, Switching Sequence Design, Inverter Output Waveforms and Harmonic Content , Even-Order Harmonic Elimination, Neutral-Point Voltage Control, Causes of Neutral-Point Voltage Deviation , Effect of Motoring and Regenerative Operation, Feedback Control of Neutral-Point Voltage

.

UNIT - IV

DC-DC Switch-Mode Converters & Switching DC Power Supplies Control of dc-dc converter, Buck converter, boost converter, buck-boost converter, cuk dc-dc converter, full bridge dc-dc converter, dc-dc converter comparison. Introduction, linear power supplies, overview of switching power supplies, dc-dc converters with electrical isolation, control of switch mode dc power supplies, power supply protection, and electrical isolation in the feedback loop, designing to meet the power supply specifications

.

UNIT - V

Resonant Converters & Power Conditioners and Uninterruptible Power Supplies Classification of resonant converters, basic resonant circuit concepts, load-resonant converters, resonant-switch converters, zero-

voltage-switching, resonant-dc-link inverters with zero-voltage switching's, high frequency-link integral-half cycle converters. Power line disturbances, Introduction to Power Quality, power Conditioners, uninterruptible power supplies, Applications.

TEXTBOOKS:

1. "M. H. Rashid", Power electronics circuits, Devices and applications, PHI, I edition – 1995.

2. "Ned Mohan, Tore M. Undeland and William P. Robbins, A", "Power Electronics converters, Applications and Design" John Wiley & Sons, Inc., Publication, 3rd Edition 2003.

REFERENCE BOOK:

"Bin Wu, A", "High-Power Converters and Ac Drives" John Wiley & Sons, Inc., Publication (Free down load from rapidshire.com) 2006.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem

L	T	P	C
3	0	0	3

(20EE5PE12) HIGH VOLTAGE ENGINEERING
(Professional Elective-1)

Prerequisite: Basic ElectricalEngineering, Electrical Machines-I, Electrical Machines-II

Course Objectives:

1. To deal with the detailed analysis of Breakdown occurring in gaseous, liquids and solid dielectrics
2. To inform about generation and measurement of High voltage and current
3. To introduce High voltage testing methods
4. To understand operation behind the gas as insulating media and collision process.
5. To understand generation of over voltages due to switching surges
6. To understand the testing and measurement of radio interference measurements.

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

1. Apply the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.
2. Explain the generation of D. C., A.C., & Impulse voltages.
3. Prepare the testing on H. V. equipment and on insulating materials, as per the standards.
4. Discuss how over-voltages arise in a power system, and protection against these over-voltages.
5. Compare the Various standards for HV Testing of electrical apparatus, IS, IEC standards.

UNIT – I

Breakdown in Gases

Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge

Breakdown in Liquid and Solid Insulating Materials

Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

UNIT -II

Generation of High Voltages

GenerationofhighD.C. voltages, generationofhighA.C. voltages, generationofimpulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT - III

Measurements of High Voltages and Currents

Peak voltage, impulse voltageand high direct current measurement method, cathoderayoscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.

UNIT – IV

Lightning and switching over-voltages

Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges. Switching over voltages, Protection against over-voltages, Surge diverters, and Surge modifiers.

UNIT-V

High Voltage Testing of Electrical Apparatus and High Voltage Laboratories Various standards for HV Testing of electrical apparatus, IS, IEC standards, testing of insulators and bushings, testing of

isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs

TEXTBOOKS:

1. High Voltage Engineering, M.S. Naidu and V. Kamaraju, TMH Publications.

2. High Voltage Engineering, C.L. Wadhwa, New Age Internationals (P) Limited

REFERENCE BOOK:

1. High Voltage Engineering: Fundamentals by E. Kuffel, W.S. Zaengl, J. Kuffel by Elsevier. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age
2. International (P) Limited.

3. High Voltage Engineering, Theory and Practice, MazenAdbel Salam, Hussein, AhdanEI-Morshedy Roshdy Radwan, Marcel Dekker

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem

L	T	P	C
3	0	0	3

(20EE5PE13) Electrical Machine Design
(Professional Elective –I)

Course Objectives:

1. To know the major considerations in electrical machine design, electrical engineering materials,
2. space factor, choice of specific electrical and magnetic loadings,
3. To analyze the thermal considerations, heat flow, temperature rise, rating of machines.
4. To understand the design of transformers
5. To study the design of induction motors
6. To know the design of synchronous machines
7. To understand the CAD design concepts

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

1. Explain the construction and performance characteristics of electrical machines.
2. Use the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
3. Interpret the principles of electrical machine design and carry out a basic design of an AC machines.
4. Calculate the design parameters of transformers.
5. Use software tools to do design calculations.

UNIT - I

Introduction: Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines

UNIT - II

Transformers: Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

UNIT – III

Induction Motors: Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of poly-phase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT – IV

Synchronous Machines: Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of airgap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

UNIT – V

Computer Aided Design (CAD): Limitations (assumptions) of traditional designs need for CAD analysis, synthesis and hybrid methods, Design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to complex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

TEXTBOOKS:

1. K. Sawhney, "A Course in Electrical Machine Design", DhanPatRai and Sons, 1970.
2. M.G. Say, "Theory & Performance & Design of A.C. Machines", ELBS London.

REFERENCE BOOK:

1. S. K. Sen, "Principles of Electrical Machine Design with computer programs", Oxford and IBH Publishing, 2006.
2. K. L. Narang, "A Text Book of Electrical Engineering Drawings", SatyaPrakashan, 1969.
3. Shanmugasundaram, G. Gangadharan and R. Palani, "Electrical Machine Design Data Book", New Age International, 1979.
4. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.
5. Electrical machines and equipment design exercise examples using Ansoff's Maxwell 2D Machine design package

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-I Sem

L	T	P	C
3	0	0	3

(20EE5PE14): INTERNET OF THINGS (Professional Elective - I)

Course Objectives:

1. To introduce the terminology, technology and its applications.
2. To introduce the concept of M2M (machine to machine) with necessary protocols.
3. To introduce the Python Scripting Language which is used in many IoT devices.
4. To introduce the Raspberry PI platform, that is widely used in IoT applications.
5. To introduce the implementation of web-based services on IoT devices.

Course outcomes:

1. To interpret the knowledge on areas to be used and protocols of communication in IoT.
2. To compare and contrast software and hardware things in different networks.
3. To extend the knowledge on python and its libraries used in IoT.
4. To apply the skills to develop the small-scale things.
5. To illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

UNIT I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoTrotocols, IoT communication models, Iot Communication APIs IoT enabled Technologies-Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

UNIT II

IoTandM2M–Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP NETPEER.

UNIT III

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data / time operations, classes, Exception handling Python packages-JSON, XML, HTTPLib, URLLib, SMTPLib.

UNIT IV

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API.

TEXTBOOKS:

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE6PE21) SMART GRID TECHNOLOGIES

(Professional Elective-II)

Course Objectives:

1. group various aspects of the smart grid
2. To defend smart grid design to meet the needs of a utility
3. To select issues and challenges that remain to be solved
4. To analyze basics of electricity, electricity generation, economics of supply and demand, and the various aspects of electricity market operations in both regulated and deregulated environment.

Course outcomes: Upon the completion of the subject, the student will be able to

1. Explain the structure of an electricity market in either regulated or deregulated market conditions.
2. Apply the advantages of DC distribution and developing technologies in distribution
3. Discriminate the trade-off between economics and reliability of an electric power system.
4. Differentiate various investment options (e.g., generation capacities, transmission, renewable, demand-side resources, etc.) in electricity markets
5. Analyze the development of smart and intelligent domestic systems

UNIT-IIntroduction: Introduction to smart grid- Electricity Network-Local energy networks Electric transportation- Low carbon central generation-Attributes of the smart grid- Alternate views of a smart grid.

Smart Grid to Evolve a Perfect Power System: Introduction- Overview of the perfect power system configurations- Device level power system- Building integrated power systems- Distributed power systems-Fully integrated power system-Nodes of innovation.

UNIT II

DC Distribution and Smart Grid: AC vs DC sources-Benefits of and drives of DC power delivery systems-Powering equipment and appliances with DC-Data centers and information technology loads-Future Neighborhood-Potential future work and research.

Intelligrid Architecture for the Smart grid: Introduction- Launching intelligrid- Intelligrid today- Smart grid vision based on the intelligrid architecture-Barriers and enabling technologies. SCADA, synchro phasors (WAMS)

UNIT III

Dynamic Energy Systems Concept: Smart energy efficient end use devices-Smart distributed energy resources-Advanced whole building control systems- Integrated communications architecture-Energy management-Role of technology in demand response Current limitations to dynamic energy management-Distributed energy resources-Overview of a dynamic energy management-Key characteristics of smart devices- Key characteristics of advanced whole building control systems-Key characteristics of dynamic energy management system.

UNIT IV

Energy Port as Part of The Smart Grid: Concept of energy -Port, generic features of the energy port. Policies and Programs to Encourage End – Use Energy Efficiency: Policies and programs in action -multinational - national-state-city and corporate levels. Market Implementation: Framework-factors influencing customer acceptance and response - program planning-monitoring and evaluation

UNIT V

Efficient Electric End – Use Technology Alternatives: Existing technologies – lighting - Space conditioning - Indoor air quality - Domestic water heating - hyper efficient appliances - Ductless residential heat pumps and air conditioners - Variable refrigerant flow air conditioning-Heat pump water heating - Hyper efficient residential

appliances - Data center energy efficiency- LED street and area lighting - Industrial motors and drives - Equipment retrofit and replacement - Process heating - Cogeneration, Thermal energy storage - Industrial energy management programs - Manufacturing process-Electro-technologies, Residential, Commercial and industrial sectors.

TEXTBOOKS:

1. Clark W Gelling's, "The Smart Grid, Enabling Energy Efficiency and Demand Side Response"- CRC Press, 2009.
2. Jean ClaudeSabonnadiere, NoureddineHad said, "Smart Grids", Wiley-ISTE, IEEE Press, May 2012

REFERENCE BOOKS:

1. JanakaEkanayake, KithsiriLiyanage, Jianzhong. Wu, Akihiko Yokoyama, Nick Jenkins, "Smart Grid: Technology and Applications"- Wiley, 2012.
2. James Momoh, "Smart Grid: Fundamentals of Design and Analysis"-Wiley, IEEE Press, 2012.

3 0 0 3

(20EE6PE22) RENEWABLE ENERGY SOURCES (Professional Elective-II)

Course Objectives:
It introduces solar energy its radiation, collection, storage and application. It also introduces the Wind energy, Biomass energy, geothermal energy and ocean energy as alternative energy sources.

Course Outcomes:
1. To study the physics of wind power and energy
2. To understand the principle of operation of wind generators
3. To know the solar power resources
4. To know the wind and bio-mass energies
5. To know the geothermal, ocean power and energies

UNIT I
Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT II
Solar Energy Collection, Storage & Applications: Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.
Storage & Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT III
Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.
Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT IV
Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT V
Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, and principles of DEC.

TEXTBOOKS:
1. Non-Conventionnel Energy Sources, G.D. Rai, Khanna Publishers.
2. Introduction to renewable energy, Vaughn Nelson, CRC Press (Taylor & Francis).

REFERENCE BOOKS:
1. Renewable Energy Resources, Twidell&Wier, CRC Press (Taylor & Francis).
2. Renewable Energy Sources and Emerging Technologies, D. P. Kothari, K. C. Singal, Rakesh Ranjan, PHI Learning Private Limited.
3. Fundamentals of Renewable Energy Systems, D. Mukherjee, S. Chakrabarti, New Age International.
4. Renewable Energy Power for a sustainable Future, Godfrey Boyle, Oxford University Press.
5. Renewable energy resources, Tiwari and Ghosal, Narosa publications.
6. Renewable Energy Technologies, Ramesh & Kumar, Narosa publications.
7. Non-Conventional Energy Systems, K Mittal, Wheeler publication

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE – II Sem

L	**T**	**P**	**C**
3	**0**	**0**	**3**

(20EE6PE23) SPECIAL MACHINES (Professional Elective-II)

Course Objectives: To learn.

1 To understand the working and construction of special machines
2 To know the use of special machines in different feed-back systems
3 To understand the use of digital controllers for different machines

Course outcomes: Upon the completion of this subject, the student will be able

1. Explain the operation of stepper motor control
2. Analyse the operation of variable reluctance stepping motors.
3. Sketch the construction & operation of PMDC, BLDC motors.
4. Interpret the concept of Double-sided Linear Induction motor
5. Explain operation of Permanent Magnet Axial Flux Machines

UNIT I

Stepper Motors: Introduction-synchronous inductor (or hybrid stepper motor), Hybrid stepping motor, construction, principles of operation, energization with two phases at a time- essential conditions for the satisfactory operation of a 2-phase hybrid step motor – very slow – speed synchronous motor for servo control-different configurations for switching the phase windings-control circuits for stepping motors-an open-loop controller for a 2-phase stepping motor.

UNIT II

Variable Reluctance Stepping Motors: Variable reluctance (VR) Stepping motors, single-stack VR step motors, Multiple stack VR motors-Open-loop control of 3-phase VR step motor-closed-Loop control of step motor, discriminator (or rotor position sensor) translator, major loop-characteristics of step motor in open-loop drive – comparison between open-loop position control with step motor and a position control servo using a conventional (dc or ac) servo motor- Suitability and areas of application of stepping motors-5- phase hybrid stepping motor – single phase – stepping motor, the construction, operating principle torque developed in the motor.

Switched Reluctance Motor: Introduction – improvements in the design of conventional reluctance motors- Some distinctive differences between SR and conventional reluctance motors-principle of operation of SRM- Some design aspects of stator and rotor pole arcs, – power converter for SR motor-A numerical example –Rotor sensing mechanism and logic control, drive and power circuits, position sensing of rotor with Hall problems-derivation of torque expression, general linear case.

UNIT III

Permanent Magnet Materials and PM DC Machines: Introduction, Hysteresis loops and recoil line stator frames (pole and yoke – part) of conventional PM dc Motors, Equivalent circuit of PM Generator and Motor-Development of Electronically commutated dc motor from conventional dc motor.

Brushless DC Motor: Types of construction – principle of operation of BLDM- sensing and switching logic scheme, sensing logic controller, lockout pulses –drive and power circuits, Base drive circuits, power converter circuit-Theoretical analysis and performance prediction, –Theory of BLDM as variable speed synchronous motor (assuming sinusoidal flux distribution) - Methods or reducing Torque Pulsations, 180 degrees pole arc and 120-degree current sheet.

UNIT IV

Linear Induction Motor: Development of a double-sided LIM from rotary type IM- A schematic of LIM drive for electric traction development of one-sided LIM with back iron-field analysis of a DSLIM fundamental assumptions.

UNIT V

Permanent Magnet Axial Flux (Pmaf) Machines: Construction, Armature windings – Toroidal Stator and Trapezoidal Stator Windings, Torque and EMF equations, Phasor diagram and output equation.

TEXTBOOKS:

1. Special electrical machines, K. Venkata Ratnam, – University press.
2. Special electrical machines, E. G. Janardanan, – PHI.
3. R. K. Rajput, "Electrical machines"-5th edition.
4. V. V. Athani, "Stepper motor: Fundamentals, Applications and Design"- New age international pub.

3 0 0 3

(20EE6PE24) COMPUTER ORGANIZATION (Professional Elective-II)

Course Objectives: To learn.

1 The purpose of course is to introduce fundamental concept of organization & architectural design of Digital computer.
2 Demonstrate the concepts of register transfer language and Instruction for mats.
3 Understand the design of processor and various addressing modes of instructions.

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

1. Demonstrate the functional organization of digital computer system.
2. Classify different addressing modes for fetching machine instructions.
3. Apply different data representation formats and perform arithmetic operations.
4. Tell the design of input/output organization and memory organization of computer.
5. Demonstrate the concepts of parallel processing, pipelining and inter process communication

UNIT- I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro-operations, shift micro-operations, Arithmetic logic shift unit.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro-operations, shift micro-operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT- II

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT – III

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT - IV

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

UNIT – V

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, ArrayProcessor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, inter processor arbitration, Inter processor communicationand synchronization, Cache Coherence.

TEXTBOOKS:

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI

REFERENCE BOOKS:

1. Computer Organization – Car Hamacher, ZvonksVranesic, Safea Zaky, Vth Edition, Mc Graw Hill.
2. Computer Organization and Architecture–William Stallings Sixth Edition, Pearson/PHI.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE - II Sem

L	**T**	**P**	**C**
3	**0**	**0**	**3**

(20EE6OE11): RENEWABLE ENERGY SOURCES (Open Elective-I)

Course Objectives:
It introduces solar energy its radiation, collection, storage and application. It also introduces the Wind energy, Biomass energy, geothermal energy and ocean energy as alternative energy sources.

Course outcomes:

1. To study the physics of wind power and energy
2. To understand the principle of operation of wind generators
3. To know the solar power resources
4. To know the wind and bio-mass energies.
5. To know the geothermal, ocean power and energies.

UNIT – I:
Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT-II:
Solar Energy Collection, Storage & Applications: Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.
Storage & Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-III:
Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.
Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT-IV:
Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-V:
Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, and principles of DEC.

TEXTBOOKS:

1. Non-Conventional Energy Sources, G.D. Rai, Khanna Publishers.
2. Introduction to renewable energy, Vaughn Nelson, CRC Press (Taylor & Francis).

REFERENCE BOOKS:

1. Renewable Energy Resources, Twidell&Wier, CRC Press (Taylor & Francis).
2. Renewable Energy Sources and Emerging Technologies, D. P. Kothari, K. C. Singal, RakeshRanjan, PHI Learning Private Limited
3. Fundamentals of Renewable Energy Systems, D. Mukherjee, S. Chakrabarti, New Age International.
4. Renewable Energy Power for a sustainable Future, Godfrey Boyle, Oxford University Press.
5. Renewable energy resources, Tiwari and Ghosal, Narosa publications.
6. Renewable Energy Technologies, Ramesh & Kumar, Narosa publications.
7. Non-Conventional Energy Systems, K Mittal, Wheeler publications

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III Year B.Tech. EEE - II Sem

L	T	P	C
3	0	0	3

(20EE6OE12): ELECTRICAL ENGINEERING MATERIALS (Open Elective-I)

Course Objectives:

1 To understand the importance of various materials used in electrical engineering
2 Obtain a qualitative analysis of their behaviour and applications.

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

1. Explain various types of dielectric materials, their properties in various conditions.
2. Describe the magnetic material properties and their behaviour.
3. Explain about the semiconductor materials and technologies.
4. Analyse the Materials used in electrical engineering and its applications.
5. Illustrate the different types of Special purpose materials.

UNIT- I

Dielectric Materials: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyro electric materials.

UNIT – II

Magnetic Materials: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magneto striction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis.

UNIT – III

Semiconductor Materials: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large-scale integration techniques (VLSI).

UNIT – IV

Materials for Electrical Applications: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

UNIT – V

Special Purpose Materials: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, insulating varnishes and coolants, Properties and applications of mineral oils, testing of Transformer oil as per ISI.

TEXTBOOKS:

1. "R K Rajput", "A course in Electrical Engineering Materials", Laxmi Publications, 2009
2. "T K Basak", "A course in Electrical Engineering Materials", New Age Science Publications 2009

REFERENCE BOOKS:

1. TTTI Madras, "Electrical Engineering Materials", McGraw Hill Education, 2004.
2. "Adrian's. Dekker", Electrical Engineering Materials, PHI Publication, 2006.
3. S. P. Seth, P. V. Gupta "A course in Electrical Engineering Materials", DhanpatRai&

(20EE7OE21) DESIGN OF ELECTRICAL SYSTEMS (Open Elective –II)

Course Outcomes:

1. To understand the concept of design philosophies and detailing the electrical System
2. To know the MD estimation of HV motors and substations.
3. To know the MD calculation of transformers and CB
4. To understand the short circuit analysis and calculations
5. To know the selection of cable parameters

UNIT-I
General Introduction, gathering specific data, Adoption of design – parameters for the particular project, Selection of basic design philosophies, Detailing the electrical System, Preparation of as – erected drawings and design – manuals.

UNIT-II
Maximum-demand – MD estimation, Demand factors for HV motors, Calculation of MD on the MCCs, MD, estimation for an entire load-center substation and MSS, Statutory Inspector's approach to MD estimation

UNIT –III
Sizing of transformer capacity on basis of MD calculations, Consideration and constraints in the sizing of transformers CB ratings, Split bus arrangements, sizing of power-transformer capacity, Sizing of distribution transformer, capacity at ICSS, Techno-economic studies on selection of transformer sizes, sizing the transformer to meet HV motor, starts and voltage dips.

UNIT –IV
Short-circuit calculations, SC analysis, standards for the SC analysis, Passive and dynamic reactance to be considered for SC analysis, Reactance multipliers for first cycle diagram for SC analysis of 415V system, The computation of AC components of fault currents, Determination of DC component of the fault current and the total fault current, IEC equations, The impact of CB status on fault levels.

UNIT –V
Selection of cable sizes, Continuous rating of cables (Standard rating and nitrating), Thermal amp city of cables, short time short circuit rating of cables, Mechanical withstand of short circuit forces, Techno economic consideration in selection of cables, SC-withstand capacity of 1.1 kV cable, Voltage drops in 415V motor, feeders and voltage drop based ampacity, The use of copper cables for motors of rating less than 7.5 kW.

TEXTBOOKS:

1. B N. Balasubramanian 'Design of Electrical Systems (For Large projects)', Revised edition, The Rukmini studies, Chennai, 1999.

REFERENCE BOOKS:

1. NEB Hand book
2. IEEE Hand book

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-I Sem

L	T	P	C
3	0	0	3

(20EE7OE22): ENERGY STORAGE SYSTEMS (Open Elective -II)

Course Objectives:

1. After completion of this course, the student will be able to
2. Analyze the characteristics of energy from various sources and need for storage
3. Classify various types of energy storage and various devices used for the purpose

Course outcomes:

1. To understand the Electrical Energy Storage Technologies
2. To understand the need of Electrical Energy Storage
3. To understand the features of energy storage systems
4. To know the types of energy storage systems
5. To understand the various applications of energy storage systmes

UNIT I

Electrical Energy Storage Technologies: Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, long distance between generation and consumption, Congestion in power grids, Transmission by cable.

UNIT II

Needs for Electrical Energy Storage: Emerging needs for EES, more renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT III

Features of Energy Storage Systems: Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

UNIT IV

Types of Electrical Energy Storage systems: Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES), Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

UNIT V

Applications: Present status of applications, Utility use (conventional power generation, grid operation & service) , Consumer use (uninterruptable power supply for large consumers), New trends in applications ,Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems , Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA– aggregation of many dispersed batteries

TEXTBOOKS:

1. "James M. Eyer, Joseph J. Iannucci and Garth P. Corey ", "Energy Storage Benefits and Market Analysis", Sandia National Laboratories, 2004.
2. The Electrical Energy Storage by IEC Market Strategy Board.

REFERENCE BOOKS:

1. "Jim Eyer, Garth Corey", Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE - I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE7PE11) SWITCHED MODE POWER CONVERSION
(Professional Elective - III)

Course Objectives:
After completion of this course the students are able to
1. Understand the concepts and principle of operation of various types of switched mode power supply systems for both D.C. and A.C. outputs.

UNIT I
Switched Mode Power Conversion: Introduction to Switched Mode Power Supply, Linear DC to DC Power converters, non-Idealities in reactive elements, Design of Inductors, Design of Transformers-Copper loss, Power factor, non-isolated topologies, Isolated topologies, Quasi-resonant zero-current/zero-voltage switch Operating principle of Non-Isolated DC to DC power Converters (Buck, Boost, Buck-Boost, and Cuk) Equivalent circuit model of the non-isolated DC-DC converters. Isolated converters (forward, Flyback).

UNIT II
Multiple Output Flyback Switch Mode Power Supplies: Introduction, operating Modes, operating principles, Direct off line Flyback Switch Mode Power Supplies, Flyback converter, snubber network, Problems.

UNIT III
Using Power Semiconductors in Switched Mode Topologies: Introduction to Switched Mode Power Supply Topologies, The Power Supply Designer's Guide to High Voltage Transistors, Base Circuit Design for High Voltage Bipolar Transistors in Power Converters, Isolated Power Semiconductors for High Frequency Power Supply Applications

UNIT IV
Rectification: Explanation, Advantages and disadvantages, SMPS and linear power supply comparison, Theory of operation, Input rectifier stage, Inverter stage, Voltage converter and output rectifier, Regulation, An Introduction to Synchronous Rectifier Circuits using Power MOS Transistors

UNIT V
Switch mode variable power supplies: Introduction, variable SMPS techniques, operating principles, practical limiting factors, Efficiency and EMI Applications.
Resonant Power Supplies: An Introduction to Resonant Power Supplies, Resonant Power Supply Converters - The Solution for Mains Pollution Problems.

TEXTBOOKS:
1. "Keith H. Billings and Taylor Morey", "Switch Mode Power Supplies", Tata McGraw-Hill Publishing Company, 3rd edition 2010.
2. "Robert W. Erickson", "Switch Mode Power Supplies", Springer, 2nd edition 2001.

REFERENCE BOOKS:
1. "SanjayaManiktala", "Switching Power Supplies A-Z", Elsevier, 2nd Edition 2012
2. "Steven M. Sandler", Switch Mode Power Supplies, Tata McGraw Hill, 1 st Edition 2006

(20EE7PE12) UTILIZATION OF ELECTICAL POWER
(Professional Elective - III)

Course Objectives: Objectives of this course are

1 To understand the fundamentals of illumination and good lighting practices
2 To understand the methods of electric heating and welding.
3 To understand the concepts of electric drives and their application to electrical traction systems.

Course outcomes: At the end of the course the student will be able to:

1. Explain basic principles of electric heating and welding.
2. Prepare the lighting requirements for flood lighting, household and industrial needs
3. Calculate heat developed in induction furnace.
4. Sketch the speed time curves for traction
5. Develop the systems of Train lighting methods.

UNIT II

Electric Welding: Electric welding equipment, resistance welding and arc welding, comparison between AC and DC welding. Electrolysis process: principle of electrolysis, electroplating, metal extraction andmetal processing, electromagnetic stirs.

UNIT III

Illumination: Terminology, Laws of illumination, coefficient of Utilization and depreciation, Polar curves, Photometry, integrating sphere, sources of light, fluorescent lamps, compact fluorescent lamps, LED lamps discharge lamps, mercury vapor lamps, sodium vapor lamps and neon lamps, comparison between tungsten filament lamps and fluorescent tubes. Basic principles of light control, Types and design of lighting scheme, lighting calculations, factory lighting, street lighting and flood lighting.

UNIT IV

Electric Traction: Systems of electric traction and track electrification- DC system, single phase and 3-phase low frequency and high frequency system, composite system, kando system, comparison between AC and DC systems, problems of single-phase traction with current unbalance and voltage unbalance. Mechanics of traction movement, speed – time curves for different services, trapezoidal and quadrilateral speed – time curves, tractive effort, power, specific energy consumption, effect of varying acceleration and braking, retardation, adhesive weight and braking retardation, coefficient of adhesion.

UNIT V

Systems of Train Lighting: special requirements of train lighting, methods of obtaining unidirectional polarity constant output- single battery system, Double battery parallel block system, coach wiring, lighting by making use of 25KV AC supply.

TEXTBOOKS:

1. H. Partab: Modern Electric Traction, DhanpatRai & Co, 2007.
2. E. Openshaw Taylor: Utilization of Electric Energy, Orient Longman, 2010

REFERENCE BOOKS:

1. H. Partab: Art & Science of Utilization of Electric Energy, DhanpatRai& Sons, 1998.
2. N.V. Suryanarayana: Utilisation of Electrical power including Electric drives and Electric Traction, New Age Publishers, 1997.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE7PE13): DIGITAL CONTROL SYSTEMS
(Professional Elective - III)

Course Objectives:

1 To understand the fundamentals of digital control systems, z-transforms
2 To understand state space representation of the control systems, concepts of controllability and observability
3 To study the estimation of stability in different domains
4 To understand the design of discrete time control systems, compensators, state feedback controllers, state observers through various transformations

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

1. Obtain discrete representation of LTI systems.
2. Analyze stability of open loop and closed loop discrete-time systems.
3. Design and analyze digital controllers.
4. Design state feedback and output feedback controllers.

UNIT I

Discrete Representation of Continuous Systems: Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modeling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

UNIT II

Discrete System Analysis: Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system. Stability of Discrete Time System: Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.

UNIT III

State Space Approach for Discrete Time Systems: State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability, reach-ability, Reconstruct ability and observability analysis. Effect of pole zero cancellation on the controllability &observability.

UNIT IV

Design of Digital Control System: Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

UNIT V

Discrete Output Feedback Control: Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems.

TEXTBOOKS:

1. K. Ogata, “Digital Control Engineering”, Prentice Hall, Englewood Cliffs, 1995.
2. M. Gopal, “Digital Control Engineering”, Wiley Eastern, 1988

REFERENCE BOOKS:

1. G. F. Franklin, J. D. Powell and M. L. Workman, “Digital Control of Dynamic Systems”, Addison Wesley, 1998.
2. B.C. Kuo, “Digital Control System”, Holt, Rinehart and Winston, 1980.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE - II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE7PE14) EMBEDDED SYSTEMS
(PROFESSIONAL ELECTIVE –III)

Course Objectives:

1 To provide an overview of principles of Embedded System
2 To provide a clear understanding of role of firmware, operating systems in correlation with hardwaresystems**.**

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

1. Expected to understand the selection procedure of processors in the embedded domain.
2. Design procedure of embedded firm ware.
3. Expected to visualize the role of real time operating systems in embedded systems.
4. Expected to evaluate the correlation between task synchronization and latency issues

UNIT – I

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification of Embedded Systems, Major application areas, Purpose of E bedded Systems, Characteristics and Quality attributes of Embedded Systems.

UNIT - II

The Typical Embedded System: Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System components.

UNIT – III

Embedded Firmware Design and Development: Embedded Firmware Design, Embedded Firmware Development Languages, Programming in Embedded C.

UNIT - IV

RTOS Based Embedded System Design: Operating System basics, Types of Operating Systems, Tasks, Process, Threads, Multiprocessing and Multi-tasking, Task Scheduling, Threads-Processes Scheduling putting them together, Task Communication, Task Synchronization, Device Drivers, how to choose an RTOS

UNIT - V

Integration and Testing of Embedded Hardware and Firmware: Integration of Hardware and Firmware, Boards Bring up The Embedded System Development Environment: The Integrated Development Environment (IDE), Types of files generated on Cross-Compilation, Disassembler/Decompile, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan

TEXTBOOKS:

1. Shibu K V, “Introduction to Embedded Systems”, Second Edition, McGraw Hill

REFERENCE BOOKS:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, Tata McGraw-Hill
2. Frank Vahid and Tony Givargis, “Embedded Systems Design” - A Unified Hardware/Software Introduction, John Wiley
3. Lyla, “Embedded Systems” –Pearson
4. David E. Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE - I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE7PE21) ELECTRICAL & HYBRID VEHICLES
(PROFESSIONAL ELECTIVE –IV)

Prerequisite: Power Semiconductor Drives, Electrical Drives and Control, Utilization of Electric Energy

Course Objectives: To learn.

1 To understand the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
2 To know the various aspects of hybrid and electric drive train such as their configuration, types of electric machines that can be used energy storage devices, etc.

Course outcomes: At the end of this course, students will demonstrate the ability to

1. Understand the models to describe hybrid vehicles and their performance.
2. Understand the different possible ways of energy storage.
3. Understand the different strategies related to energy storage systems.

UNIT - I

Introduction: Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

UNIT - II

Introduction To Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

Hybrid Electric Drive-Trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT - III

Electric Trains: Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

Electric Propulsion Unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT – IV

Energy Storage: Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

UNIT - V

Energy Management Strategies: Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

TEXTBOOKS:

1. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, “Hybrid Electric Vehicles: Energy Management Strategies”, Springer, 2015.
3. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.

REFERENCE BOOKS:

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE7PE22) OPTIMIZATION TECHNIQUES
(PROFESSIONAL ELECTIVE –IV)

Course Objectives: Students will be able to

1 To introduce various optimization techniques i.e classical, linear programming, transportation problem**,** simplex algorithm, dynamic programming.
2 Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations
3 To explain the concept of Dynamic programming and its applications to project implementation

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

1. explain the need of optimization of engineering systems
2. understand optimization of electrical and electronics engineering problems
3. apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
4. apply unconstrained optimization and constrained non-linear programming and dynamic programming
5. Formulate optimization problems.

UNIT-I

Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT: II

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems

UNIT: III

Unconstrained Non-linear Programming: One dimensional minimization method, Classification, Fibonacci method and Quadratic interpolation method

Unconstrained Optimization Techniques: Uni-variant method, Powell's method and steepest descent method.

UNIT: IV

Constrained Non-linear Programming: Characteristics of a constrained problem - classification - Basic approach of Penalty Function method - Basic approach of Penalty Function method - Basic approaches of Interior and Exterior penalty function methods - Introduction to convex programming problem.

UNIT: V

Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution

TEXTBOOKS:

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice by John Wiley and Sons, 4th edition, 2009.
2. H. S. Kasene& K. D. Kumar, Introductory Operations Research, Springer (India), Pvt. Ltd., 2004

REFERENCE BOOKS:

1. George Bernard Dantzig, MukundNarainThapa, “Linear programming”, Springer series in
2. operations research 3rd edition, 2003.
3. H. A. Taha, “Operations Research: An Introduction”, 8th Edition, Pearson/Prentice Hall, 2007.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE7PE23) INDUSTRIAL ELECTRICAL SYSTEMS
(PROFESSIONAL ELECTIVE –IV)

Prerequisite: Utilization of Electric Energy

Course Objectives:

1. To understand the various electrical system components
2. To know the residential and commercial electrical systems
3. To study the illumination systems
4. To discuss about the industrial electrical systems

Course outcomes: At the end of this course, students will demonstrate the ability to

1. Understand the electrical wiring systems for residential, commercial and industrial consumers
2. Representing the systems with standard symbols and drawings, SLD.
3. Understand various components of industrial electrical systems.
4. Analyze and select the proper size of various electrical system components.

UNIT- I

Electrical System Components: LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

UNIT- II

Residential and Commercial Electrical Systems: Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

UNIT- III

Illumination Systems: Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premise, flood lighting.

UNIT- IV

Industrial Electrical Systems – I: HT connect ion, industrial substation, Transformer select ion, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT- V

Industrial Electrical Systems – II: DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

TEXTBOOKS:

1. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating & costing”, Khanna publishers, 2008.
2. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2007.

REFERENCE BOOKS:

1. S. Singh and R. D. Singh, “Electrical estimating and costing”, DhanpatRai and Co., 1997.
2. Web site for IS Standards.
3. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-I Sem

L	T	P	C
3	1	0	4

(20EE7PE24) VLSI DESIGN
Professional Elective- IV

Course Objectives: The objectives of the course are to:

1. Give exposure to different steps involved in the fabrication of ICs using MOS transistor,
2. CMOS/BICMOS transistors and passive components.
3. Explain electrical properties of MOS and Bic MOS devices to analyze the behavior of inverters
4. designed with various loads.
5. Give exposure to the design rules to be followed to draw the layout of any logic circuit
6. Provide concept to design different types of logic gates using CMOS inverter and analyze their

Course outcomes: Upon successfully completing the course, the student should be able to:

1. Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS
2. transistors.
3. Choose an appropriate inverter depending on specifications required for a circuit
4. Draw the layout of any logic circuit which helps to understand and estimate parasitic of any
5. logic circuit
6. Design different types of logic gates using CMOS inverter and analyze their transfer
7. characteristics. Provide design concepts required to design building blocks of data path using

UNIT –I: Introduction:
Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &BiCMOS Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I ds -V ds relationships, MOS transistor threshold Voltage, g m, g ds, Figure of merit ùo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT -II: VLSI Circuit Design Processes:
VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 ìm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT –III: Gate Level Design:
Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

UNIT -IV: Data Path Subsystems:
Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters. Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT -V: Programmable Logic Devices:
PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design. CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

TEXTBOOKS:

1. Essentials of VLSI Circuits and Systems – Kamran Eshraghian, EshraghianDougles and A. Pucknell, PHI, 2005 Edition.
2. 2CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. CMOS logic circuit Design - John.P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K. Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
5. Introduction to VLSI – Mead & Convey, BS Publications, 2010.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-I Sem

L	**T**	**P**	**C**
3	**0**	**0**	**3**

(20EE7MS01) FUNDAMENTALSOF MANAGEMENT FOR ENGINEERS

Course Objectives: To understand and the Management Concepts, applications of Concepts in PracticalaspectsofbusinessanddevelopmentofManagerialSkillsforEngineers.

Course Objectives:

1 Able to apply the concepts & principles of management in real life industry.
2 Identify the areas to control and Selecting the Appropriate controlling methods/Techniques
3 Develop the process of management's four functions: planning, organizing, leading, and controlling.
4 Evaluate the concepts of HRM in Recruitment, Selection, and Training& Development.
5 The various Motivation and Control aspects a relearnt in this course

UNIT- I:

Introduction to Management Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management-Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT- II

Planning and Decision Making: General Frame work for Planning-Planning Process, Types of Plans, Management by Objectives; Production Planning and Control. Decision making and Problem-solving - Programmed and Non-Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT-III

Organization and HRM: Principles of Organization: Organizational Design Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change. Human Resource Management & Business Strategy: Job Satisfaction, Job Enrichment, Job Enlargement, Talent Management, Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT – IV

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Leadership. Motivation -Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories- Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT – V

Controlling: Control, Types and Strategies for Control, Steps in Control Process, BudgetaryandNon-BudgetaryControls.CharacteristicsofEffectiveControls, Establishing control systems, Control frequency and Methods.

TEXTBOOKS:

1. Management Essentials, Andrew Du Brin, 9e, Cengage Learning, 2012.
2. Fundamentals of Management, Stephen P. Robbins, PearsonEducation,2009.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE7PC02) POWER QUALITY & FACTS

Course Objectives:

1 Definition of power quality and different terms of power quality
2 Study of voltage power quality issue–short and long interruption
3 Detailstudyofcharacterizationofvoltagesagmagnitudeandthreephaseunbalancedvoltagesag
4 Know the behavior of power electronics loads; induction motors, synchronous motor etc by the power quality issues
5 Overview of mitigation of power quality issues by the VSI converters
6 To understand the fundamentals of FACTS Controllers,
7 ToknowtheimportanceofcontrollableparametersandtypesofFACTScontrollers&theirbenefits
8 To understand the objectives of Shunt and Series compensation
9 To Control STATCOM and SVC and the comparison and the regulation of STATCOM, Functioning and control of GCSC, TSSC and TCSC

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

1 Know the severity of power quality problems and is attribution system
2 Understandtheconceptofvoltagesagtransformationfromup-stream(highervoltages)todown-stream(lowervoltage)
3 Conceptofimprovingthepowerqualitytosensitiveloadbyvariousmitigatingcustompowerdevice
4 Choosepropercontrollerforthespecificapplicationbasedonsystemrequirement
5 Understand and various systems thoroughly and their requirement
6 UnderstandthecontrolcircuitsofShuntControllersSVC&STATCOMforvariousfunctionsviz.Trans ient stability Enhancement, volt age instability prevention and power oscillation damping
7 Understand and the Power and control circuits of Series Controllers GCSC, TSSC and TCSC

UNIT-I

Power Quality Problems in Distribution Systems: Power Quality problems in distribution systems: TransientandSteadystatevariationsinvoltageandfrequency.Unbalance, Sags, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offs ets, fluctuations. Flicker and its measurement.

UNIT-II

Transmission Lines and Series/Shunt Reactive Power Compensation: Basics of AC Transmission. Analysis of uncompensated AC transmission lines.
PassiveReactivePowerCompensation.Shuntandseriescompensationatthemid-pointofanACline.ComparisonofSeriesandShuntCompensation

UNIT-III

Static Shunt Compensators: Objectives of shunt compensation, Methods of control able VAR generation, Static Var Compensator, its characteristics, TCR, TSC, FC-TCR configurations, STATCOM, basic operating principle, control approaches and characteristics

UNIT-IV

Static Series Compensators: Objectives of series compensator, variable impedance type of series compensators, TCSC, TSSC-operating principles and control schemes, SSSC, Power Angle characteristics, Control range and VAR rating, Capability to provide reactive power compensation, external control

UNIT-V:

Combined Compensators: Introduction to Unified Power Flow Controller, Basic operating principles, Conventional control capabilities, independent control of real and reactive power.

TEXTBOOKS:

1. Electrical Power Systems Quality, Dugan RogerC, Santoso Surya, McGranaghan, Marks F.

Beaty and H. Wayre, Mc Graw Hil

2. Power Systems Quality Assessment, J. Arillaga, N.R. Watson, S. Clon, JohnWiley.

REFERENCEBOOKS:

1. Power Quality, C Sankaran, CRCPress4.Understandingpowerqualityproblems, Math H. Bollen, IE EE press
2. "Understanding FACTS– Concepts and Technology of Flexible AC Transmission Systems" Narain G. Honorani, Laszlo Gyugyi

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-I Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

(20EE7PC03) ELECTRICAL SYSTEMS & SIMULATION

Prerequisite: Electrical and Electronic circuits, Power System Analysis &Power Electronics

Course Objectives:

1 To Simulate and analyses electrical and electronic systems.
2 To evaluate the performance of trans mission lines.
3 To Analyze various Faults in power systems
4 To Model, simulate and analyze the performance of DC Matchiness and Induction Motors.
5 To Analyze performance of feedback and load frequency control of the systems

Course outcomes: After going through this lab the student will be able to

1 Design and analyze electrical systems in time and frequency domain
2 Analyze various transmission on lines and perform Ault analysis
3 Model Load frequent control of Power Systems
4 Design various Power Electronic Converters and Drives

Any ten of the following experiments are required to be conducted using suitable software

1. Design of first and second or de recircuiting time and frequency domain
2. Performance evaluation of medium and long transmission online
3. Symmetrical component a lysis
4. Transmission Line Fault Analysis
5. LG, LLand3-Φ fault analysis of Transformer
6. Short Circuit Analysis of Power system models
7. Speed Control of DC Motor
8. Speed Control of Induction motor
9. Design and analysis of feedback control system
10. Transient analysis of open-end Edline and short-circuited line
11. Load frequency control of single area and two area power system
12. Economic Dispatch of Thermal Units
13. Design of Single Phase and Three Phase Inverters
14. Design of Single Phase and Three Phase Full Converters

REFERENCEBOOKS:

1. C.L. Wadhwa: Electrical Power Systems–Third Edition, NewAgeInternationalPub.Co.,2001.
2. HadiSadat: Power System Analysis–TataMcGraw HillPub.Co.2002.
3. "I. J. Nagrath& M. Gopal", Control Systems Engineering, New Age InternationalPub.Co.,5th Edition2009.
4. A.E. Clayton&C.I. Hancock Performance and Design of DCMachines, CBSPublisher,1stEdition2004.

(20EE8OE31) UTILIZATION OF ELECTRICAL ENERGY
(Open Elective-III)

Prerequisite: (Prerequisite: Electrical Machines-I & Electrical Machines-II

Course Objectives:

1 To understand the fundamentals of illumination and good lighting practices
2 To understand the methods of electric heating and welding.
3 To understand the concepts of electric drives and their application to electrical traction systems.

Course outcomes: At the end of the course the student will be able to:

1. Explain basic principles of electric heating and welding.
2. Prepare the lighting requirements for flood lighting, household and industrial needs
3. Calculate heat developed in induction furnace.
4. Sketch the speed time curves for traction
5. Develop the systems of Train lighting methods.

UNIT - I

Electric Drives: Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT - II

Electric Heating: Advantages and methods of electric heating, resistance heating induction heating and dielectric heating.

Electric Welding: Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT - III

Illumination: Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light.

Various Illumination Methods: Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT - IV

Electric Traction – I: System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostat braking and regenerative braking. Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT - V

Electric Traction-II: Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesion.

TEXTBOOKS:

1. E. Openshaw Taylor, Utilization of Electric Energy – by university press, 1961.
2. Partab, H., 'Art and Science of Utilization of Electrical Energy', DhanpatRai and Sons, New Delhi, 1986.

REFERENCEBOOKS:

1. . V. Suryanarayana, Utilization of Electrical Power including Electric drives and Electric traction, New Age International (P) Limited, Publishers, 1996.
2. C. L. Wadhwa, Generation, Distribution and Utilization of electrical Energy, New Age International (P) Limited, Publishers, 1997.

3. Tripathy, S.C., 'Electric Energy Utilization and Conservation', Tata McGraw Hill Publishing Company Ltd. New Delhi, 1991.

3 0 0 3

(20EE8OE32) ENERGY CONSERVATION &AUDIT

(Open Elective-III)

Course Objectives:

1 To know the necessity of conservation of energy
2 To generalize the methods of energy management
3 To illustrate the factors to increase the efficiency of electrical equipment
4. To detect the benefits of carrying out energy audits.

Course outcomes Upon the completion of this course, the student will be able to

1 Tell energy audit of industries
2 Predict management of energy systems
3 Sequence the methods of improving efficiency of electric motor
4. Analyze the power factor and to design a good illumination system
5. Determine pay back periods for energy saving equipment

UNIT - I

Basic Principles of Energy Audit: Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT – II

Energy Management: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting- Energy manger, Qualities and functions, language, Questionnaire – check list for top management.

UNIT – III

Energy Efficient Motors: 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

UNIT - IV

Power Factor Improvement, Lighting and Energy Instruments: Power factor – methods of improvement, location of capacitors, pf with nonlinear loads, effect of harmonics on power factor, power factor motor controllers – 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.

UNIT V

Economic Aspects and Analysis: Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis- Energy efficient motors-calculation of simple payback method, net present worth method- Power factor correction, lighting – Applications of life cycle costing analysis, return on investment

TEXTBOOKS:

1. Energy management by W.R. Murphy AND G. Mckay Butter worth, Heinemann publications.
2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998

REFERENCEBOOKS:

1. Energy efficient electric motors by John.C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995-
2. Energy management hand book by W.C. Turner, John wiley and sons
3. Energy management and good lighting practice: fuel efficiency- booklet 12-EEO

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE8PE11) HVDC TRANSMISSION

(Professional Elective - V)

Prerequisite: Power System-I, Power System-II, Power System Protection, Power System Operation and Control, Power Electronics

Course Objectives:

1 To compare EHV AC and HVDC systems
2 To analyze Graetz circuitandalsoexplain6and12pulseconverters
3 To control HVDC systems with various methods and to perform power flow analysis/DC systems

Course outcomes: After completion of this course the students able to

1 Compare EHVAC and HVDC system and to describe various types of DC links
2 Analyze Graetz circuit for rectifier and inverter mode of operation
3 Describe various methods for the control of HVDC systems and to perform power flow an alysisin AC/DC systems
4 DescribevariousprotectionmethodsforHVDCsystemsandclassifyHarmonicsanddesigndifferentty pesoffilters
5 Determine pay back periods for energy saving equipment

UNIT - I

Basic Concepts Necessity of HVDC systems, Economics and Terminal equipment of HVDC transmission systems, Types of HVDC Links, Apparatus required for HVDC Systems, Comparison of AC and DC Transmission, Application of DC Transmission System, Planning and Modern trend sin D.C. Transmission.

Analysis of HVD C Converters: Choice of Converter Configuration, Analysis of Graetz circuit, Characteristics of 6 Pulse and 12 Pulse converters, Cases of two 3 phase converters in Y/Y mode – their performance.

UNIT - II

Converter and HVDC System Control: Principle of DC Link Control, Converters Control Characteristics, firing angle control, Current and extinction angle control, Effect of source inductance on the system, Starting and stopping of DCl ink, Power Control.

Reactive Power Control in HVDC: Introduction, Reactive Power Requirements in steady state, sources of reactive power- Static VAR Compensators, Reactive power control during transients.

UNIT - III

Power Flow Analysis in AC/DC Systems: Modelling of DC Links, DC Network, DC Converter, Controller Equations, Solution of DC load flow, P.U. System for DC quantities, solution of AC-DC Power flow-Simultaneous Method-Sequential method.

UNIT - IV

Converter Faults and Protection: Converter faults, protection against over current and over voltage in converter station, surge arresters, smoothing reactors, DC breakers, Audible noise, space charge field, corona effects on DC lines, Radioing deference.

UNIT – V

Harmonics: Generation of Harmonics, Characteristics harmonics, calculation of AC Harmonics, Non-Characteristic adverse effects of harmonics**,** verse effects of harmonics, Calculation of voltage and Current harmonics, Effect of Pulse number on harmonics

Filters: Types of AC filters, Design of Single tuned filters–Design of High pass filters.

TEXTBOOKS:

1. K.R. Padiyar, HVDC Power Transmission Systems: Technology and system Interactions, New Age International (P) Limited, and Publishers,1990.
2. "SKK amakshaiah, VKamaraju", HVDC Transmission, MH Publishers, 2011

REFERENCEBOOKS:

1. "S. Rao", EHVAC and HVDC Transmission Engineering and Practice, Khannapublications,3rdEdition1999.
2. "Jos Arrillaga", HVDC Transmission, The institution of electrical engineers, IEEpower&energyseries29,2nd edition 1998.
3. "E.W. Kimbark", Direct Current Transmission, John Wiley and Sons, volume 1,1971.
4. "E. Uhlmann Power Transmission by Direct Current, B. S Publications, 20

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-II Sem

L	**T**	**P**	**C**
3	**0**	**0**	**3**

(20EE8PE12): DEREGULATED POWER SYSTEM
(Professional Elective - V)

Course outcomes:

1 To understand the concept and Fundamentals of Restructured Systems
2 To understand the models of restructuring systems
3 To estimate the transmission pricing
4 To know the transmission open access issues
5 To know the power sector restructuring in India

UNIT - I
Fundamentals of Restructured System: History of power system restructuring, concept of power system deregulation, regulation vs. deregulation, entities in deregulated system, market architecture, ancillary services

UNIT - II
Models of Restructuring: Pool Co and bilateral contractual models, ISO based markets models, reactive power balancing market, day ahead and hour ahead markets

UNIT - III
Transmission Pricing: Cost components in transmission pricing, embedded cost-based transmission pricing methods, Postage Stamp, MW-Mile, incremental cost based or location marginal pricing (LMP), Tracing of power.

UNIT- IV
Transmission Open Access Issues: Available Transfer Capability (ATC) - definition and methods of determination, transmission network congestion, congestion management techniques.

UNIT - V
Power Sector Restructuring in India: Electricity Act 2003, Evaluation of integrated, monopoly, state owned electricity boards, introduction to various institutions in Indian power sector & their role. Challenges before the Indian power sector, planning commission CEA, NT, PFC, ministry of power, SEBS.

TEXTBOOKS:

1. Electric Utility Planning and regulation – Edward Kahn, University of California- 2005
2. Various Indian Electricity Acts 1). Indian Electricity Act, 1910
3. The Electricity Supply Act, 1998 proposed Electricity Bill 2001
4. Electrical Energy Utilization and Conservation: - S.C. Tripathi (TMH Pub.)-2003
5. http://www.nptel.iitm.ac.in

(20EE8PE13) AI TECHNIQUES IN ELECTRICAL ENGINEERING
(Professional Elective - V)

Pre-requisites: Power Systems Operation and Control

Course Objectives:

1 To locate soft commanding methodologies, such as artificial neural networks, Fuzzy logic
2 and genetic Algorithms.
3 To observe the concepts of feed forward neural networks and about feedback neural
4. networks.
5. To practice the concept of fuzziness involved in various systems and comprehensive
6. knowledge of fuzzy logic control and to design the fuzzy control
7. To analyze genetic algorithm, genetic operations and genetic mutations

Course outcomes: Upon the completion of this course, the student will be able to

1 Understand feed forward neural networks, feedback neural networks and learning techniques.
2 Understand fuzziness involved in various systems and fuzzy set theory.
3 Develop fuzzy logic control for applications in electrical engineering
4 Develop genetic algorithm for applications in electrical engineering.

UNIT – I

ARTIFICIAL NEURAL NETWORKS Introduction, Models of Neuron Network-Architectures – Knowledge representation, Artificial Intelligence and Neural networks–Learning process-Error correction learning, Hebbian learning –Competitive learning-Boltzman learning, supervised learning-Unsupervised learning–Reinforcement Learning-Learning tasks

UNIT – II

ANN PARADIGMS Multi-layer perceptron using Back propagation Algorithm (BPA), Self –Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network.

UNIT - III

FUZZY LOGIC Introduction –Fuzzy versus crisp, Fuzzy Sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets –Fuzzy Cartesian Product, Operations on Fuzzy relations –Fuzzy logic– Fuzzy Quantifiers, Fuzzy InferenceFuzzy Rule based system, Defuzzification methods.

UNIT - IV

GENETIC ALGORITHMS Introduction-Encoding –Fitness Function-Reproduction operators, Genetic Modeling –Genetic Operators-Cross over Single site cross over, two points cross over –Multi point cross over Uniform cross over, Matrix cross over-Cross over Rate-Inversion & Deletion, Mutation operator – Mutation –Mutation Rate-Bit-wise operators, Generational cycle-convergence of Genetic Algorithm.

UNIT - V

APPLICATIONS OF AI TECHNIQUES Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area system and two area system, Reactive power control, Speed control of DC and AC Motors.

TEXTBOOKS:

1. S. Rajasekaran and G.A.V. Pai Neural Networks, Fuzzy Logic & Genetic Algorithms, PHI, New Delhi, 2003.
2. Rober J. Schalkoff, Artificial Neural Networks, Tata McGraw Hill Edition, 2011.

REFERENCE BOOKS:

1. P.D. Wasserman; Neural Computing Theory & Practice, Van Nostrand Reinhold, New York, 1989.

2. Bart Kosko; Neural Network & Fuzzy System, Prentice Hall,1992
3. D.E. Goldberg, Genetic Algorithms, Addison-Wesley 1999

3 0 0 3

(20EE8PE14): SIGNALS & SYSTEMS
(Professional Elective - V))

Course Objectives:

1 ThisgivesthebasicsofSignalsandSystemsrequiredforallElectricalEngineeringrelatedcourses.
2 To underset and the behavior of signal intime and frequency domain
3 To understand the characteristics of LTI systems
4 ThisgivesconceptsofSignalsandSystemsanditsanalysisusingdifferenttransformtechniques

Course outcomes: Up on successful completion of the course, students will be able to

1 Apply the concept of orthogonality on signals and systems.
2 Demonstrate the concepts of Fourier series and Fourier Transform techniques for given specifications.
3 Analyze system characteristics for given specifications.
4 Estimate ROC and stability conditions of S and Z domains for given conditions.
5 Design a given system using concept of sampling theorem and correlation.

UNIT-I

Signal Analysis: Definition of Signals and Systems, Classification of Signals & Systems, Exponential and Sinusoidal signals, Concept of Impulse Function, Unit Step function, Signum function, Elementary Operations on Signals, 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

UNIT-II

Fourier series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Wave symmetry, Gibbs phenomenon complex Fourier spectrum.

Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier trans form, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Trans form.

UNIT-III

S**ignal Transmission through Linear Systems:** Linear System, Impulse response, Response of a Linear System, Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, TransferfunctionofaLTISystem, Filter characteristicofLinearSystem, Distortionless transmissionthroughways stem, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley

Wiener criterionforphysical realization, RelationshipbetweenBandwidthandrisetime, Convolution andCorrelation of Signals, Concept of convolution in Time domain andFrequencydomain, Graphical representation of Convolution

UNIT-IV

Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, and Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, LaPlace Transform of certain signals using wave form syn thesis.

Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Trans forms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms. Representation of stability of a system using Laplace and Z-Transforms

UNIT-V

Sampling theorem: Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling –Aliasing,

Introduction to B and Pass Sampling.

Correlation: Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parseval's Theorem, Power Density Spectrum, RelationbetweenAutocorrelationFunctionandEnergy/PowerSpectralDensityFunction, Relation between Convolution and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal from Noise by Filtering.

TEXTBOOKS:

1. Signals, Systems & Communications-B.P. Lathi,2013, BSP.
2. Signals and System s-A.V. Oppenheim, A.S. Willsky and S.H. Nawabi,2Ed.

REFERENCE BOOKS:

1. Signals and Systems–Simon Haykin and VanVeen, Wiley2Ed.,
2. Signals sand Systems –A. RamaKrishnaRao,2008, TMH
3. Fundamentals ofSignalsandSystems-MichelJ.Robert,2008, MGH International Edition.
4. Signals, Systems and Transforms -C.L. Philips, J.M. ParrandEveA.Riskin,3Ed.,2004, PE.
5. Signal and Systems–K. Deergha Rao, Birkhauser,2018

3 0 0 3

(20EE8PE21) ADVANCED ELECTRIC DRIVES
(Professional Elective - VI))

Prerequisite: Power Electronics, Power Semiconductor Drives

Course Objectives:

1 To know the power electronic converters
2 To analyze the various control strategies of power converters for drives control
3 To understand the advanced control techniques for DC and AC motor drives
4 To go through the control strategies for drives using digital signal processors

Course outcomes: At the end of this course, students will demonstrate the ability to

1 Understand the operation of power electronic converters and their control strategies.
2 Understand the vector control strategies for ac motor drives
3 Understand the implementation of the control strategies using digital signal processors

UNIT I

Power Converters for AC Drives: PWM control of inverter, selected harmonic elimination, space vector modulation, current control of VSI, three level inverter, Different topologies, SVM for 3 level inverter, Diode rectifier with boost chopper, PWM converter as line side rectifier, current fed inverters with self-commutated devices. Control of CSI, H Bridge as a 4-Q drive.

UNIT II

Induction Motor Drives: Different transformations and reference frame theory, modeling of induction machines, voltage fed inverter control-v/f control, vector control, direct torque and flux control (DTC).

UNIT III

Synchronous Motor Drives: Modeling of synchronous machines, open loop v/f control, vector control, direct torque control, CSI fed synchronous motor drives.

UNIT IV

Permanent Magnet Motor Drives: Introduction to various PM motors, BLDC and PMSM drive configuration, comparison, block diagrams, Speed and torque control in BLDC and PMSM. Switched Reluctance Motor Drives: Evolution of switched reluctance motors; various topologies for SRM drives, comparison, closed loop speed and torque control of SRM.

UNIT V

DSP Based Motion Control: Use of DSPs in motion control, various DSPs available, and realization of some basic blocks in DSP for implementation of DSP based motion control.

TEXTBOOKS:

1. B. K. Bose, “Modern Power Electronics and AC Drives”, Pearson Education, Asia, 2003.
2. 2. P. C. Krause, O. Wasynczuk and S. D. Sudhoff, “Analysis of Electric Machinery and Drive Systems”, John Wiley & Sons, 2013.

REFERENCE BOOKS:

1. H. A. Taliyat and S. G. Campbell, “DSP based Electromechanical Motion Control”, CRC press, 2003.
2. 2. R. Krishnan, “Permanent Magnet Synchronous and Brushless DC motor Drives”, CRC Press, 2009.

IV Year B.Tech. EEE-II Sem **L T P C**
3 0 0 3

(20EE8PE22) ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective - VI)

Prerequisites: Power System – I, Power System – II

Course Objectives:

1 To distinguish between transmission and distribution systems
2 To understand design considerations of feeders
3 To compute voltage, drop and power loss in feeders
4 To understand protection of distribution systems
5 To examine the power factor improvement and voltage control

Course outcomes: After completion of this course, the student able to

1 Distinguish between transmission, and distribution line and design the feeders
2 Compute power loss and voltage drop of the feeders
3 Design protection of distribution systems
4. Understand the importance of voltage control and power factor improvement

UNIT – I

General Concepts: Introduction to distribution system, Distribution system planning, Factors effecting the Distribution system planning, Load modelling and characteristics. Coincidence factor - contribution factor - Loss factor - Relationship between the load factor and loss factor. Load growth, Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

Distribution Feeders: Design Considerations of Distribution Feeders: Radial, loop and network types of primary feeders, Introduction to low voltage distribution systems (LVDS) and High voltage distribution systems (HVDS), voltage levels, Factors effecting the feeder voltage level, feeder loading, Application of general circuit constants (A, B, C, D) to radial feeders, basic design practice of the secondary distribution system, secondary banking, secondary network types, secondary mains.

UNIT - II

Substations: Location of Substations: Rating of distribution substation, service area with 'n' primary feeders. Benefits derived through optimal location of substations. Optimal location of Substations (Perpendicular bisector rule and X, Y co-ordinate method).

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, analysis of non-three phase systems, method to analyze the distribution feeder cost.

UNIT - III

Protection: Objectives of distribution system protection, types of common faults and procedure for fault calculations, over current Protective Devices: Principle of operation of Fuses, Auto-Circuit Recloser - and Auto-line sectionalizes, and circuit breakers. Coordination: Coordination of Protective

Devices: Objectives of protection co-ordination, general coordination procedure, Types of protection coordination: Fuse to Fuse, Auto-Recloser to Fuse, Circuit breaker to Fuse, Circuit breaker to Auto-Recloser.

UNIT - IV

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

UNIT - V

Voltage Control: Voltage Control: Importance of voltage control, methods of voltage control, Equipment for voltage control, effect of shunt capacitors, effect of series capacitors, effect of AVB/AVR on voltage control, line drop compensation, voltage fluctuations.

TEXTBOOKS:

1. TuranGonen, Electric Power Distribution System Engineering, CRC Press, 3rd Edition 2014.
2. V. Kamaraju, Electrical Power Distribution Systems, Tata McGraw Hill Publishing Company, 2 nd edition, 2010

REFERENCE BOOKS:

1. G. Ram Murthy, Electrical Power Distribution hand book, 2nd edition, University press 2004.
2. A.S. Pabla, Electric Power Distribution, Tata McGraw Hill Publishing company, 6th edition, 2013.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE8PE23) CONTROL SYSTEM DESIGN
(Professional Elective-VI)

Prerequisite: Control Systems

Course Objectives:

1 To know the time and frequency domain design problem specifications.
2 To understand the design of classical control systems in time-domain
3 To analyze the design aspects of classical control systems in frequency-domain
4 To know the design of various compensator controllers
5 To identify the performance of the systems by design them in state-space
6 To study the effects of nonlinearities on various systems performance

Course outcomes: At the end of this course, students will demonstrate the ability to

1 Understand various design specifications.
2 Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).

UNIT - I

Design Specifications: Introduction to design problem and philosophy. Introduction to time domain and frequency domain design specification and its physical relevance. Effect of gain on transient and steady state response. Effect of addition of pole on system performance. Effect of addition of zero on system response.

UNIT - II

Design of Classical Control System In The Time Domain: Introduction to compensator. Design of Lag, lead lag-lead compensator in time domain. Feedback and Feed forward compensator design. Feedback compensation. Realization of compensators.

UNIT - III

Design of Classical Control System In Frequency Domain: Compensator design in frequency domain to improve steady state and transient response. Feedback and Feed forward compensator design using bode diagram.

UNIT - IV

Design of PID Controllers: Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems. Control loop with auxiliary feedback – Feed forward control.

UNIT - V

Control System Design in State Space: Review of state space representation. Concept of controllability &observability, effect of pole zero cancellation on the controllability &observability of the system, pole placement design through state feedback. Ackerman's Formula for feedback gain design. Design of Observer. Reduced order observer. Separation Principle.

Non-linearities and Its Effect on System Performance: Various types of non-linearities. Effect of various non-linearities on system performance. Singular points. Phase plot analysis.

TEXTBOOKS:

1. N. Nise, "Control system Engineering", John Wiley, 2000.
2. J. Nagrath and M. Gopal, "Control system engineering", Wiley, 2000.

REFERENCE BOOKS:

1. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988.

2. K. Ogata, "Modern Control Engineering", Prentice Hall, 2010.
3. B. C. Kuo, "Automatic Control system", Prentice Hall, 1995.
4. J. J. D'Azzo and C. H. Houpis, "Linear control system analysis and design (conventional and modern)", McGraw Hill, 1995.
5. R. T. Stefani and G. H. Hostetter, "Design of feedback Control Systems", Saunders College Pub,1994.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV Year B.Tech. EEE-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20EE8PE24) DIGITAL SIGNAL PROCESSING
(**Professional Elective-VI)**

Prerequisite: Signals and Systems

Course Objectives:

1 To provide background and fundamental material for the analysis and processing of digital signals.
2 To understand the fast computation of DFT and appreciate the FFT processing.
3 To study the designs and structures of digital (IIR and FIR) filters and analyze and synthesize for agiven specifications.
4 To acquaint in multi-rate signal processing techniques and finite word length effects.

Course outcomes: Upon completing this course, the student will be able to

1 Understand the LTI system characteristics and multi-rate signal processing.
2 Understand the inter-relationship between DFT and various transforms.
3 Design a digital filter for a given specification.
4. Understand the significance of various filter structures and effects of round off errors

UNIT I

Introduction: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion

UNIT II

Discrete Fourier series: Fourier Series, Fourier Transform, Laplace Transform and Z-Transform relation, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z Transform.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

UNIT III

IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT IV

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT V

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXTBOOKS:

1. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007

REFERENCE BOOKS:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – S. Salivahanan, A. Vallavaraj and C. Gnanapriya, TMH, 2009
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2 nd Edition, Pearson Education, 2009

Program Educational Objectives (PEO's):

PEO 1: Students will have strong foundation in the basic principles of sciences, Mathematics, Electrical and Electronics Engineering to analyze and design and create eco-friendly products and solutions for real life problems.

PEO 1.1: Students will have strong foundation in the basic principles of sciences, Mathematics, Electrical and Electronics Engineering.
PEO 1.2: Students will have strong foundation to analyze, design and create eco-friendly products and solut ions for real life problems.

PEO 2: Students will be better employable and achieve success in their chosen areas of Electrical and Electronics Engineering and related field.

PEO 2.1: Students will be better employable
PEO 2.2: Students will achieve success in their chosen areas of Electrical and Electronics Engineering and related field.

PEO 3: Students will be successful engineers with necessary professional skills, effective oral, written communication and team building activities in multi-disciplinary areas with right attitude and Ethics.

PEO 3.1: Students will be successful engineers with necessary professional skills, effective oral, written communication
PEO 3.2: Students will be successful with team building activities in multi-disciplinary areas with right att tude and Ethics.

Programme Outcomes (PO's) :

PO1.Engineering knowledge: Ability to obtain and apply the knowledge of science and engineering essentials in problem solving.

PO2.Problem Analysis: Ability to undertake problem recognition ,formulation and providing ideal solution.

PO3.Design/ development of solutions: An ability to design, implement a computer based system, with desire program to meet the needs of social and environmental considerations.

PO4.Conduct investigations of complex problems: An ability to apply mathematical formulas, algorithmic principles and computational theory to develop a model and design of computer based system.

PO5. Modern tool usage: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

PO6.Engineer and society: An ability to analyze the impact of computing in different organizations, society including the varying policy issues that are taken care off.

PO7.Environment and sustainability: understanding of impact of engineering solutions on the environment and this attains sustainability with responsibility.

PO8.Ethics: An ability to lead a strong professionalism and the ethical values.
PO9.Individual and team work: An ability to function effectively on multidisciplinary environments leads to leadership and member of team work.
PO10. Communication: An ability to communicate effectively in both verbal and written form which enables to prepare well documentation for report writing and a project.
PO11.Project management and finance: Apply project management practices to the launch of new programs, initiatives, products, services, and events relative to the stakeholder needs including – finance.
PO12.Life-long learning: RRecognition of the need for higher studies and inspires to update the latest technologies by the way of life long learning process from time to time.

Program Specific Outcomes: (PSO's):

PSO1: Students will be able to demonstrate an ability to analyze, design and provide engineering solutions in the areas related to Electrical Drives, Electrical Machines, Power Electronics, Control Systems and Power Systems.

PSO2: Students of EEE are able to develop and design the electrical and electronic circuits using simulation software's such as P-SPICE, MATLAB and will be able to utilize the techniques and participate to succeed in competitive examinations like GATE, TOFEL, GRE and GMAT etc.

Institutes Under

TKR EDUCATIONAL SOCIETY

Teegala Krishna Reddy Engineering College(TKEM)

TKR College of Engineering and Technology(TKRC)

TKR Institute of Management and Science(TKRB)

TKR College of Pharmacy(TKRP)