R22

ACADEMIC REGULATIONS, COURSE STRUCTURE, AND DETAILED SYLLABUS

ELECTRICAL AND ELECTRONICS ENGINEERING

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2022-23)

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2023-2024)

Offered under Choice Based Credit System (CBCS)

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.
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1.0 Under Graduate Degree Programme in Engineering & Technology (UGP in E&T)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE (TKREC) offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice BasedCredit System (CBCS) in all branches of Engineering with effect from the Academic Year 2022-23

2.0. Eligibility for Admission

2.1. Admission to the undergraduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAMCET) or the University or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time.

2.2. The medium of instructions for the entire undergraduate programme in Engineering & Technology will be **English** only.

3.0 B.TECH. PROGRAMME STRUCTURE

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

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

3.2.1. Semester Scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters of 22 weeks (≥ 90 instructional days) each and in each semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum /course structure suggested by AICTE are followed.

3.2.2 Credit Courses

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

- One credit for one hour/ week/ semester for Theory/ Lecture (L) courses or Tutorials.
- One credit for two hours/ week/ semester for Laboratory/ Practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab are mandatory courses. These courses will not carry any credits.

3.2.3 Subject Course Classification

All subjects/ courses offered for the undergraduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The College

has followed almost all the guidelines issued by AICTE/UGC.

S. NO.	CATEGORY	Suggested breakup of credits (Total 160)
1	Humanities and Social sciences including Management	10*
2	Basic Sciences	22.5*
3	Engineering Sciences courses including Workshop, Drawing, basics of Electrical /Mechanical / Computer etc.	18.5*
4	Professional Core Courses	63*
5	Professional Elective Courses relevant to chosen specialization/branch	19*
6	Open Electives-Electives from other technical and/or emerging subjects	9*
7	Project work, Seminar and Internship in Industry or elsewhere	18*
8	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	01, 02, 03, 04, 05, 06, 07, 08
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.	01 to 09

4.0. COURSE REGISTRATION

4.1. A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

4.2. The academic section of the college invites 'registration forms' from students before the beginning 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 SEEs (Semester End Examinations) of the 'preceding semester'**.

4.3. A student can apply for **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor / counselor, 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 and the student.

4.4. A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s) / course(s) limited to 6 Credits (any 2 elective subjects), based on **progress** and SGPA/ CGPA, and completion of the '**pre-requisites'** as indicated for various subjects / courses, in the department course structure and syllabus contents.

4.5. Choice for '**additional subjects/ courses**', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor / Mentor / HOD.

4.6. If the student submits ambiguous choices or multiple options or erroneous entries during **on-line** registration for the subject(s) / course(s) under a given/ specified course group/ category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.

4.7. 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 could not be offered due to any inevitable or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject(subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within **a week** after the commencement of class-work for that semester.

4.8. Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.

4.9**. Open Electives**: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat / should not match with any category (Professional Core, Professional Electives, and Mandatory Courses etc.) of subjects even in the forthcoming semesters.

4.10**. Professional Electives**: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

5.0. SUBJECTS / COURSES TO BE OFFERED

5.1. A subject/ course may be offered to the students, **only if** a minimum of 15 students opt for it.

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

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

5.4. In case of options coming from students of other departments/ branches/ disciplines (not considering **open electives**), first **priority** shall be given to the student of the '**parent department**'.

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 of all the subjects/ courses (including attendance in mandatory courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab) for that semester. **Two periods** of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. **This attendance should alsobe included in the attendance submitted every fortnight to the College Examination Branch.**

6.2. Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3. A stipulated fee shall be payable for condoning of shortage of attendance.

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

6.5. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled, including all academic credentials (internal marks etc.) of that semester**. They will not be promoted to the next semester.** They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be re- registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

6.6. A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0. ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied, in addition to the attendancerequirements mentioned in Item No. **6**.

7.1. A student shall be deemed to have satisfied the academic requirements and earned the credits

allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks including minimum 35% of average Mid-Term examinations for 25 marks) in the internal examinations, not less than 35% (21 marks out of 60 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing **'C'** grade or above in that subject/ course.

7.2. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Industry Oriented Mini Project / Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time ResearchProject (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

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

7.3. **Promotion Rules**

S. No.	Promotion	Conditions to be fulfilled
1	**First year first semester to firstyear second semester**	**Regular course of study of first year first semester.**
2	**First year second semester to Second year first semester**	**(i) Regular course of study of first yearsecond semester.** **(ii) Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whetherthe student takes those examinations or not.**
3.	**Second year first semester to Second year second semester**	**Regular course of study of second year first semester.**
4	**Second year second semester toThird year first semester**	**(i) Regular course of study of second year second semester.**

		(ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	**Third year first semester to Thirdyear second semester**	**Regular course of study of third year first semester.**
6	**Third year second semester to Fourth year first semester**	**(i) Regular course of study of third year second semester.** **(ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second Semester from all the relevant regular and supplementary examinations,whether the student takes those examinations or not.**
7	**Fourth year first semester toFourth year second semester**	**Regular course of study of fourth year first semester.**

7.4. A student (i) shall register for all courses /subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA $\geq$ 5.0 (in each semester), and CGPA $\geq$ 5 (at the end of 8 semesters), (iv) **passes all the mandatory courses,** to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA **(at the end of undergraduate programme),** and shall be indicated in the grade card / marks memo of IV-year II semester.

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

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

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

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

8.0. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

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

8.2. In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of one part for 30 marks with a total duration of 2 hours as follows:

1. Midterm Examination in descriptive mode for 30 marks:

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

2. Assignment for 5 marks. (Average of 2 Assignments each for 5marks)
3. Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the concerned subject for 5 marks.

The descriptive paper shall contain 5 full questions out of which, the student has to answer all the questions, each carrying 6 marks and internal choice may be given. Average of two mid-term examinations (I Mid-Term & II Mid-Term) will be taken as final marks for mid-term examinations (For 30 marks).

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

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

Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

- The student, in each subject, shall have to earn 35% of marks(i.e.14 marks out of 40 marks) in CIE, 35% of marks (i.e.21 marks out of 60) in SEE and overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together to get pass grade (i.e. **C**) or above.
- The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 continuous Internal Examination (CIE) marks.
- In case, the student appears for Semester End Examination of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled in spite of appearing the SEE.

There is NO Computer Based Test (CBT) for R22 regulations.

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

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

The duration of Semester End Examination is 3 hours.

<u>The details of evaluation of end semester exam are as follows</u>

- Double evaluation of the answer scripts for the External Examinations 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.

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

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

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

semester end practical examination.

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

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

10 marks for write-up

15 marks for experiment/program

15 marks for evaluation of results

10 marks for presentation on another experiment / program in the same laboratory course and

10 marks for viva-voce on concerned laboratory course

❖ The student, in each subject, shall have to earn 35% of marks(i.e.14 marks out of 40 marks) in CIE, 35% of marks (i.e.21 marks out of 60) in SEE and overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together to secure Pass grade (i.e. "C") or above.

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

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

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

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

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

Part A: Objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks.

Part B: Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

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

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

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

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

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

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

2) II Year II Semester *Real-Time (or) Field-based Research Project* course: The Continuous Internal Evaluation (CIE) is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e. 20 marks out of 50 marks from average of the two examinations. There shall be NO externalevaluation. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (iii) secures less than 40% marks in this course..

8.5. There shall be Industry training (or) Internship (or) Industry oriented Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation /semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project

shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Industry Oriented Mini Project (or) Internship etc, Internal Supervisor and a SeniorFaculty Member of the Department. There shall be **NO internal marks** for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal (or) Industry Oriented Mini Project.

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

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

8.8. For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule.

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

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

For conducting viva-voce of project, Controller and Principal selects an external examiner from the list of experts in the relevant branch submitted by the HOD concerned

A student, who has failed, may reappear once for the above evaluation, when it is scheduled again; if student 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.

8.10. A student shall be given one time chance to re-register for a maximum of two subjects in a semester

- If the internal marks secured by a candidate in the continuous Internal Evaluation marks for 40 (sum of average of two mid-term exams and two assignments & subject Viva-voce / PPT / Poster presentation / Case Study on the topic in concerned subject) are less than 35% and failed in those subjects.
- A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the class work in next academic year.

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

9.0 GRADING PROCEDURE

9.1. Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/ Practical's / Industry-Oriented Mini Project/Internship / SDC and Project Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

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

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	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

9.3. A student who has obtained an '**F**' grade in any subject shall be deemed to have '**failed**' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4. To a student who has not appeared for an examination in any subject, '**Ab**' grade will be allocated in that subject, and he is deemed to have '**Failed**'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remainthe same as those obtained earlier.

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

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

Credit Points (CP) = Grade Point (GP) x Credits …. For a course

9.7. A student passes the subject/course only when GP $\geq$ **5 ('C' grade or above)**

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

$$\mathbf{SGPA} = \{\sum_{i=1}^{n} \mathbf{Ci\ Gi}\} / \{\sum_{i=1}^{n} \mathbf{Ci}\} \ldots\ldots \mathbf{For\ each\ semester},$$

where 'i' is the subject indicator index (considering 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), C_i is the no. of credits allotted to the i^{th} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} 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 (of 160) in **all** semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

$$\mathbf{CGPA} = \{\sum_{j=1}^{m} \mathbf{Cj\ Gj}\} / \{\sum_{j=1}^{m} \mathbf{Cj}\} \text{ for all S Semesters Registered}$$

(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 the 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), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

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

SGPA = 152/21 = 7.24

Illustration of Calculation of CGPA up to 3rd Semester:

Semester	Course/ Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24

II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	69		Total Credit Points	518

CGPA = 518/69 = 7.51

The calculation process of CGPA illustrated above 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 the CGPAs will be used.

9.11. SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0. PASSING STANDARDS

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

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

earned. **There is NO exemption of credits in any case.**

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.

$$\% \text{ of Marks} = (\text{final CGPA} - 0.5) \times 10$$

12.0. 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 $\geq$ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have '**qualified'** for the award of B.Tech. Degree in the branch of Engineering selected at the time of admission.

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

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

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

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

12.4. Students with final CGPA (at the end of the undergraduate programme) $\geq$ 7.0 but < 8.00 shall be placed in **'First Class'.**

12.5. Students with final CGPA (at the end of the undergraduate programme) $\geq$ 6.00 but < 7.00, shall be placed in '**Second Class'**.

12.6. All other students who qualify for the award of the degree (as per item 12.1), with finalCGPA (at the end of the undergraduate programme) $\geq$ 5.00 but < 6, shall be placed in '**pass class**'.

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

12.8. Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**Gold Medal**'.

12.9. **Award of 2-Year B.Tech. Diploma Certificate**

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) up to B. Tech. – II Year – II Semester, if the student want to exit the 4-Year B. Tech. program. The student **once opted and awarded for 2-Year UG Diploma Certificate, the student will not be permitted to join** in B. Tech. III Year – I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree.

2. A student may be permitted to take one year break after completion of II Year – II Semester or B. Tech. – III Year – II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

13.0 WITHHOLDING OF RESULTS

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

14.0. TRANSITORY REGULATIONS

A. For students detained due to shortage of attendance:

(1) A Student who has been detained in I year of R20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech./B. Pharmacy programme within the stipulated period of eight academic years from the date of first admission in I Year.

(2) A student who has been detained in any semester of II, III and IV years of R20 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech./B. Pharmacy within the

stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

(i) A student of **R20** Regulations who has been detained due to lack of credits, shall be promoted to the next semester of **R22** Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both **R20 & R22** regulations. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The **R22** Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in **R22** Regulations:

(i) A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.

(ii) The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. **There is NO exemption of credits in any case**.

(iii) If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the University.

Note: If a student readmitted to R22 Regulations and has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the College Principals concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

15.0 STUDENT TRANSFERS

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

15.2. There shall be no transfers from one college/stream to another within the college.

15.3. The students seeking transfer to TKREC from various other Universities / institutions have to pass the failed subjects which are equivalent to the subjects of TKREC, and also pass the subjects of TKREC which the students have not studied at the earlier institution. Further, though the students

have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of TKREC, the students have to study those subjects in TKREC in spite of the fact that those subjects are repeated.

15.4 The transferred students from other Universities/Institutions to TKREC who are on rolls are to be provided one chance to write the CBT (for internal marks) in the **equivalent subject(s)** as per the clearance letter issued by the University.

15.5 The College will provide one chance to write the internal examinations in the equivalent subject(s) to the students transferred from other Universities/ institutions to TKREC who are on rolls, as per the clearance equivalence) letter issued by the University.

16.0 SCOPE

16.1. The academic regulations should be read as a 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 Vice-Chancellor is final.

16.3. The University 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 dates notified by the University authorities.

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

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TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME) FROMTHE AY 2023-24

1. **Eligibility for the award of 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.

2. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech Programme (LES) for the award of B.Tech. degree.

3. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

5. **Promotion rule**

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester

6. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).
7. LES students are not eligible for 2-Year B. Tech. Diploma Certificate.

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MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices /Improper conduct	Punishment
	If the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, notebook, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject to the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam Hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject to the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and the relevant material will be kept in the Examinations Branch.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all College examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also de barred for two consecutive semesters from class work and all **College** examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent/	In case of students of the college, they shall be expelled from

	any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or 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 the tendency to disrupt the orderly conduct of the examination.	examination halls and cancellation of their performance in that subject and allot her subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any par there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all **College** examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also

		debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered Against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester / year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the **Controller/Principal** for further 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**	
1	22MA101BS	BS	Matrices and Calculus	3	1	0	4
2	22CH102BS	BS	Engineering Chemistry	3	1	0	4
3	22EE103ES	ES	C Programming and Data Structures	3	0	0	3
4	22EE105ES	ES	Electrical Circuit Analysis – I	3	0	0	3
5	22ME105ES	ES	Computer Aided Engineering Graphics	1	0	4	3
6	22EE106ES	ES	Elements of Electrical and Electronics Engineering	0	0	2	1
7	22CH107BS	BS	Engineering Chemistry Laboratory	0	0	2	1
8	22EE108ES	ES	C Programming and Data Structures Laboratory	0	0	2	1
			Induction Program				
Total Credits				**13**	**2**	**10**	**20**

I Year B.Tech. EEE – II Sem							
S. No	**Subject Code**	**Category**	**Subject Name**	**Hours per**			**Credits**
				L	**T**	**P**	
1	22MA201BS	BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2	22PH202BS	BS	Applied Physics	3	1	0	4
3	22ME203ES	ES	Engineering Workshop	0	1	3	2.5
4	22EN204HS	HS	English for Skill Enhancement	2	0	0	2
5	22EE205ES	ES	Electrical Circuit Analysis - II	2	0	0	2
6	22EE206ES	ES	Applied Python Programming Laboratory	0	1	2	2
7	2PH207BS	BS	Applied Physics Laboratory	0	0	3	1.5
8	22EN208HS	HS	English Language and Communication Skills Laboratory	0	0	2	1
9	22EE209ES	ES	Electrical Circuit Analysis Laboratory	0	0	2	1
10	22MC210	MC	Environmental Science	3	0	0	0
Total Credits				**13**	**2**	**14**	**20**

II Year B.Tech. EEE – I Sem							
S. No	**Subject Code**	**Category**	**Subject Name**	**Hours per**			**Credits**
				L	**T**	**P**	
1	22MA301BS	BS	Numerical Methods and Complex variables	3	1	0	4
2	22EE301PC	PC	Electrical Machines-I	3	1	0	4
3	22EE302PC	PC	Power System-I	3	0	0	3
4	22EC310PC	PC	Analog Electronic Circuits	3	0	0	3
5	22EE303PC	PC	Electro Magnetic Fields	3	0	0	3
6	22EE304PC	PC	Electrical Machines Laboratory-I	0	0	2	1
7	2EC311PC	PC	Analog Electronic Circuits Laboratory	0	0	2	1
8	22EE305PC	PC	Electrical Simulation tools Laboratory	0	0	2	1
9	22MC309	MC	Gender Sensitization Laboratory	0	0	2	0
Total Credits				**15**	**2**	**8**	**20**

II Year B.Tech. EEE – II Sem							
S. No	**Subject Code**	**Category**	**Subject Name**	**Hours per**			**Credits**
				L	**T**	**P**	
1	22CE401ES	ES	Solid Mechanics & Hydraulic Machines	3	1	0	4
2	22EE401PC	PC	Measurements and Instrumentation	3	0	0	3
3	22EE402PC	PC	Electrical Machines–II	3	0	0	3
4	22EC409PC	PC	Digital Electronics	2	0	0	2
5	22EE403PC	PC	Power System-II	3	0	0	3
6	22EC410PC	PC	Digital Electronics Laboratory	0	0	2	1
7	2EE404PC	PC	Measurements and Instrumentation Laboratory	0	0	2	1
8	22EE405PC	PC	Electrical Machines Laboratory-II	0	0	2	1
9	22EE401PW	PW	Real-time Research Project/ Field Based Project	0	0	4	2
10	22MC410	MC	Constitution of India	3	0	0	0
Total Credits				**17**	**1**	**10**	**20**

III Year B.Tech. EEE – I Sem							
S. No	**Subject Code**	**Category**	**Subject Name**	**Hours per**			**Credits**
				L	**T**	**P**	
1	22EE501PC	PC	Power Electronics	3	1	0	4
2	22EE502PC	PC	Control Systems	3	1	0	4
3	22EE503PC	PC	Microprocessors & Microcontrollers	3	0	0	3
4			Professional Elective-I	3	0	0	3
5	22HS501MS	MS	Business Economics and Financial Analysis	3	0	0	3
6	22EE504PC	PC	Microprocessors & Microcontrollers Laboratory	0	0	2	1
7	22EE505PC	PC	Power Electronics Laboratory	0	0	2	1
8	22EE506PC	PC	Control Systems Laboratory	0	0	2	1
9	22MC510	MC	Intellectual Property Rights	3	0	0	0
10	22MC511	MC	Basic Technical Training (BTT)	2	0	0	0
Total Credits				**20**	**2**	**6**	**20**

Professional Elective-I			
S.NO	**Subject Code**	**Category**	**Subject Name**
1	22EE511PE	PE	IoT Applications in Electrical Engineering
2	22EE512PE	PE	High Voltage Engineering
3	22EE513PE	PE	Computer Aided Electrical Machine Design

III Year B.Tech. EEE – II Sem							
S. No	**Subject Code**	**Category**	**Subject Name**	**Hours per**			**Credits**
				L	**T**	**P**	
1			Open Elective -I	3	1	0	4
2			Professional Elective-II	3	0	0	3
3	22EE601PC	PC	Digital Signal Processing	3	0	0	3
4	22EE602PC	PC	Power System Protection	3	0	0	3
5	22EE603PC	PC	Power System Operation and Control	3	0	0	3
6	22EE604PC	PC	Power System Laboratory	0	0	2	1
7	22EN601HS	HS	Advanced English Communication Skills Laboratory	0	0	2	1
8	22EE605PC	PC	Digital Signal Processing Lab	0	0	2	1
9	22EE601PW	PW	Industry Oriented Mini Project/ Internship	0	0	4	2
10	22MC610	MC	Environmental Science	3	0	0	0
11	22MC611	MC	Quantitative Analysis - 1	2	0	0	0
Total Credits				**23**	**0**	**10**	**20**

Open Elective-I:

S.NO	**Subject Code**	**Category**	**Subject Name**
1	22EE611OE	OE	Renewable Energy Sources
2	22EE612OE	OE	Fundamental of Electric Vehicles

*Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.

Professional Elective-II

S.NO	**Subject Code**	**Category**	**Subject Name**
1	22EE621PE	PE	Cyber-Physical Systems
2	22EE622PE	PE	Power Electronic Applications to Renewable
3	22EE623PE	PE	Wind and Solar Energy Systems

IV Year B.Tech. EEE - I Sem

S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
1	22EE701PC	PC	Power Semiconductor Drives	3	1	0	4
2			Open Elective-II	3	0	0	3
3			Professional Elective-III	3	0	0	3
4			Professional Elective-IV	3	0	0	3
5	22HS701MS	MS	Fundamentals of Management for Engineers	2	0	0	2
6	22EE702PC	PC	Simulation of Renewable Energy Systems Laboratory	0	0	4	2
7	22EE701PW	PW	Project Stage - I	0	0	6	3
8	22MC708	MC	Advance Technical Training (ATT)	3	0	0	0
Total Credits				**17**	**1**	**10**	**20**

Open Elective -II			
S.NO	**Subject Code**	**Category**	**Subject Name**
1	22EE721OE	OE	Utilization of Electric Energy
2	22EE722OE	OE	Reliability Engineering

Professional Elective-III			
S.NO	**Subject Code**	**Category**	**Subject Name**
1	22EE731PE	PE	Mobile Application Development
2	22EE732PE	PE	Signals and Systems
3	22EE733PE	PE	Electric and Hybrid Vehicles

Professional Elective-IV			
S.NO	**Subject Code**	**Category**	**Subject Name**
1	22EE741PE	PE	HVDC Transmission
2	22EE742PE	PE	Power System Reliability
3	22EE743PE	PE	Embedded Systems Applications

IV Year B.Tech. EEE - II Sem							
S. No	Subject Code	Category	Subject Name	Hours per			Credits
				L	T	P	
1			Open Elective-III	3	0	0	3
2			Professional Elective-V	3	0	0	3
3			Professional Elective-VI	3	0	0	3
4	22EE801PW	PW	Project Stage – II including Seminar	0	0	22	11
Total Credits				9	0	22	20

Open Elective –III

S.NO	Subject Code	Category	Subject Name
1	22EE831OE	OE	Charging Infrastructure for Electric Vehicles
2	22EE832OE	OE	Energy Storage Systems

Professional Elective-V			
S.NO	**Subject Code**	**Category**	**Subject Name**
1	22EE851PE	PE	Power Quality & FACTS
2	22EE852PE	PE	Solar Power Batteries
3	22EE853PE	PE	AI Techniques in Electrical Engineering

Professional Elective-VI			
S.NO	**Subject Code**	**Category**	**Subject Name**
1	22EE861PE	PE	Smart Grid Technologies
2	22EE862PE	PE	Electrical Distribution Systems
3	22EE863PE	PE	Machine Learning Applications to Electrical Engineering

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- I SEM

L	**T**	**P**	**C**
3	**1**	**0**	**4**

(22MA101BS) MATRICES AND CALCULUS

Pre-requisites: Mathematical Knowledge at pre-university level

Course out comes:

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

1 Write the matrix representation of a set of linear equation s and to analyze the solution of the system of equations
2 Find the Eigen values and Eigen vectors and reduce the quadratic form to canonical form using orthogonal transformations.
3 Apply the mean value theorems and evaluate the improper integrals using Beta and Gamma functions.
4 Find the extreme values of functions of two variables with / without constraints
5 Evaluate the multiple integrals and apply the concept to find areas, volumes.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		1								1		
CO2	2	3												
CO3	2	2		1								1		
CO4	2	1		1	2							1		
CO5		1										1		

UNIT - I: Matrices

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations-Consistency and Inconsistency of system of equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT - II: Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: Eigen values, Eigen vectors 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 using Orthogonal Transformation.

UNIT-III: Mean value theorems and Beta and Gamma Functions

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 (without proof). Beta and Gamma functions and their properties

UNIT-IV: Multivariable Calculus (Partial Differentiation and applications)

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

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

UNIT-V: 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).

TEXT BOOKS:

1 B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2016.

2 R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, NarosaPublications,10th Edition, 2020.

REFERENCE BOOKS:

1 Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2018.

2 G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

3 N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2018.

4 H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- I SEM

L	T	P	C
3	1	0	4

22CH102BS: ENGINEERING CHEMISTRY

Course Objectives:

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

Course out comes:

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

1 Apply the principle of potable water for industrial and domestic purposes.
2 Identify the electrolytic and electrochemical cells with different types of batteries and make use of corrosion control methods in industry.
3 Explore the fundamental properties of polymers and other materials in engineering field.
4 Distinguish various types of fuels and their applications in day-to-day life.
5 Develop understanding of engineering materials like cement, smart materials and Lubricants.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2	2					2		
CO2	3	2				2	2					3		
CO3	3	2				2	2					2		
CO4	3	2	1				2					3		
CO5	3	2					2					2		

Unit-I: Water and its treatment:

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

Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods – Softening of waterby ion- exchange processes. Desalination of water–Reverse osmosis.

UNIT - II: Battery Chemistry & Corrosion

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

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

UNIT-III: Polymeric materials:

Definition–Classification of polymers with examples– Types of polymerizations–addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene **Plastics**: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon.

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics– preparation– properties and applications of Buna-S, Butyl and Thiokol rubber. FRP (Fiber reinforced plastics), GRP (Glass reinforced plastics), CRP (Carbon fiber reinforced plastics)-Introduction and applications.

Biodegradable polymers: Concept and advantages-Polylactic acid and Poly vinyl alcohol and their applications.

UNIT-IV: Energy Sources:

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

UNIT-V: Engineering Materials:

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

Smart materials and their engineering applications

Shape memory materials- Poly L-Lactic acid. Thermoresponse materials- Poly acryl amides, Poly vinyl amides **Lubricants**: Classification of lubricants with examples-characteristics of a good lubricants–mechanism of lubrication(thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point

TEXT BOOKS:

1 Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010

2 Engineering Chemistry by Rama Devi, P.Aparna and Rath, Cengage learning, 2022

3 A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K.Shashikala, Pearson Publications, 2021.

4 Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS:

1 Engineering Chemistry by Shikha Agarwal,Cambridge University Press, Delhi(2015)

2 Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company(P)Ltd. Delh

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- I SEM

L	T	P	C
3	0	0	3

22EE103ES:C PROGRAMMING AND DATA STRUCTURES

Course Objectives: Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting

Course out comes:

1 Understand the various steps in Program development.
2 Explore the basic concepts in C Programming Language
3 Develop modular and readable C Programs
4 Understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Data structures.
5 Apply data structures such as stacks, queues in problem solving

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	0	2	0	0	0	2	1	0	0	2	2
CO2	2	3	3	0	2	0	0	0	2	1	0	0	2	2
CO3	2	3	3	0	2	0	0	0	2	0	0	0	2	2
CO4	2	3	3	0	2	0	0	0	2	0	0	0	2	2
CO5	2	3	3	0	2	0	0	0	2	0	0	0	2	2

Unit-I:

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development

Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output

Structure of a C Program – Operators, Bit-wise operators, Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Statements.

UNIT - II:

Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Recursion.

Designing Structured Programs- Functions, basics, user defined functions, inter function communication, standard functions.

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays.

UNIT-III:

Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility, **Pointer Applications** – Passing an array to a function, Memory allocation functions, array of pointers **Strings** – Concepts, C Strings, String Input / Output functions arrays of strings, string manipulation functions, string / data conversion.

UNIT-IV:

Derived types – The Typedef, enumerated types, Structures – Declaration, definition and

initialization of structures, accessing structures, operations on structures, complex structures. Unions – Referencing unions, initializers, unions and structures.

Input and Output – Text vs Binary streams, standard library functions for files, converting file types, File programs – copy, merge files.

UNIT-V:

Sorting- selection sort, bubble sort, insertion sort,

Searching-linear and binary search methods.

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

TEXT BOOKS:

1 C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

2 Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.

3 The C Programming Language, B.W. Kernighan and Dennis M.Ritchie
PHI/ Pearson Education

REFERENCE BOOKS:

1 C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.

2 C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press

3 Programming in C – Stephen G. Kochan, III Edition, Pearson Education

4 C for Engineers and Scientists, H. Cheng, McGraw-Hill International Edition

5 Data Structures using C – A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson Education / PHI

6 C Programming & Data Structures, E. Balagurusamy, TMH.

7 C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

8 C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand & Co.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- I SEM **L T P C**

3 0 0 3

22EE103ES:C PROGRAMMING AND DATA STRUCTURES

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Course out comes:

1 Understand the various steps in Program development.
2 Explore the basic concepts in C Programming Language
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4 Understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Data structures.
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Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	0	2	0	0	0	2	1	0	0	2	2
CO2	2	3	3	0	2	0	0	0	2	1	0	0	2	2
CO3	2	3	3	0	2	0	0	0	2	0	0	0	2	2
CO4	2	3	3	0	2	0	0	0	2	0	0	0	2	2
CO5	2	3	3	0	2	0	0	0	2	0	0	0	2	2

Unit-I:

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development

Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output

Structure of a C Program – Operators, Bit-wise operators, Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Statements.

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Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Recursion.

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Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays.

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Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility, **Pointer Applications** – Passing an array to a function, Memory allocation functions, array of pointers **Strings** – Concepts, C Strings, String Input / Output functions arrays of strings, string manipulation functions, string / data conversion.

UNIT-IV:

Derived types – The Typedef, enumerated types, Structures – Declaration, definition and

initialization of structures, accessing structures, operations on structures, complex structures. Unions – Referencing unions, initializers, unions and structures.

Input and Output – Text vs Binary streams, standard library functions for files, converting file types, File programs – copy, merge files.

UNIT-V:

Sorting- selection sort, bubble sort, insertion sort,

Searching-linear and binary search methods.

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2 Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.

3 The C Programming Language, B.W. Kernighan and Dennis M.Ritchie
PHI/ Pearson Education

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2 C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press

3 Programming in C – Stephen G. Kochan, III Edition, Pearson Education

4 C for Engineers and Scientists, H. Cheng, McGraw-Hill International Edition

5 Data Structures using C – A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson Education / PHI

6 C Programming & Data Structures, E. Balagurusamy, TMH.

7 C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

8 C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand & Co.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- I SEM

L	T	P	C
3	0	0	3

22EE105ES: ELECTRICAL CIRCUIT ANALYSIS –I

Prerequisites: Mathematics

Course Objectives:

1 To gain knowledge in circuits and to understand the fundamentals of derived circuit laws.
2 To learn steady state and transient analysis of single phase and 3-phase circuits.
3 To understand Theorems and concepts of coupled circuits.

Course out comes: After learning the contents of this paper the student must be able to 1.

1 Understand the network elements and basic laws.
2 Analyze the single-phase and three-phase ac circuits.
3 Apply the different types of network theorems in suitable applications
4 Understand about the coupled circuits
5 Analyze the topological description of electrical networks

	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	0	0	0	3	0	0	0	0	0	2
CO2	3	3	0	0	0	3	0	0	0	0	0	2
CO3	3	3	0	0	0	3	0	0	0	0	0	2
CO4	3	2	0	0	0	3	0	0	0	0	0	2
CO5	3	3	0	0	0	3	0	0	0	0	0	2

Unit-I:

Network Elements & Laws: Active elements, Independent and dependent sources. Passive elements — R, L and C, Energy stored in inductance and capacitance, Kirchhoff's laws, Source transformations, Star-delta transformations, Node voltage method, Mesh current method including super node and super mesh analysis

UNIT - II:

Single-Phase Circuits: RMS and average values of periodic sinusoidal and non- sinusoidal waveforms, Phasor representation, Steady-state response of series, parallel and series-parallel circuits. Impedance, Admittance, Current locus diagrams of RL and RC series and parallel circuits with variation of various parameters. Resonance: Series and parallel circuits, Bandwidth and Q-factor.

UNIT-III:

Network theorems: Superposition theorem, Thevinin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Milliman's theorem and Reciprocity theorem. (AC & DC).

UNIT-IV:

Poly-phase Circuits: Analysis of balanced and unbalanced 3-phase circuits, Star and delta connections, Measurement of three-phase power for balanced and unbalanced loads

UNIT-V:

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

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

TEXT BOOKS:

1 Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.

2 Ravish R Singh, "Network Analysis and Synthesis", McGrawHill, 2nd Edition, 2019

REFERENCE BOOKS:

1 B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.

2 James W.Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.

3 A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGraw Hill, 5th Edition, 2017.

4 Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.

5 William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGraw Hill, 6th Edition, 2002.

6 Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- I SEM

L	T	P	C
1	0	4	3

22ME105ES: COMPUTER AIDED ENGINEERING GRAPHICS

Pre-requisites: Nil

Course Objectives:

1 To develop the ability of visualization of different objects through technical drawings
2 To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products

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

1 Apply computer aided drafting tools to create 2D and 3D objects
2 sketch conics and different types of solids
3 Appreciate the need of Sectional views of solids and Development of surfaces of solids
4 Read and interpret engineering drawings
5 Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2			2				1	1		1		
CO2	2	2			2				1	1		1		
CO3	2	2			2				1	1		1		
CO4	2	2			2				1	1		1		
CO5	2	2			2				1	1		1		

Unit-I:

Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

UNIT - II:

Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes

UNIT-III:

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views

UNIT-IV:

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

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. Conversion of orthographic projection into isometric view using computer aided drafting**.**

TEXT BOOKS:

1 Engineering Drawing N.D. Bhatt / Charotar

2 Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.

REFERENCE BOOKS:

1 Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill

2 Engineering Graphics and Design, WILEY, Edition 2020

3 Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.

4 Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford

5 Computer Aided Engineering Drawing – K Balaveera Reddy et al ─ CBS Publishers

Note: - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- I SEM

L	T	P	C
0	0	2	1

22EE106ES: ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Pre-requisites: Elements of Electrical Engineering

Course Objectives:

1. To measure the electrical parameters for different types of DC and AC Circuits using conventional and theorems approach.
2. To study the transient response of various R, L and C circuits using different excitations
3. To determine the performance of different types of DC machines and Transformers

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

1. Verify the basic Electrical circuits through different experiments.
2. Evaluate the performance calculations of Electrical Machines and Transformers through Various testing methods.
3. Analyze the transient responses of R,L and C circuits for different input conditions.
4. Analyze the responses of single phase AC circuits.
5. Verify the different types of theorems.

	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	0	0	0	3	0	0	0	0	0	2
CO2	3	3	0	0	0	3	0	0	0	0	0	2
CO3	3	3	0	0	0	3	0	0	0	0	0	2
CO4	3	3	0	0	0	3	0	0	0	0	0	2
CO5	3	2	1	0	1	0	0	0	2	0	2	2

List of experiments/demonstrations:

PART-A (compulsory)

1. Verification Ohm's Law
2. Verification of KVL and KCL
3. Verification of Thevenin's and Norton's theorem
4. Verification of Superposition theorem
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Verification of Reciprocity and Milliman's Theorem
7. Transient Response of Series RL and RC circuits for DC excitation
8. Transient Response of Series RLC circuit for DC excitation

PART-B (any two experiments from the given list)

1. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
2. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
3. Performance Characteristics of a DC Shunt Motor
4. Open Circuit and Short Circuit Tests on 1-phase Transformer
5. Verification of Maximum Power Transfer Theorem

TEXT BOOKS:

1 D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.

2 MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1 P.Ramana, M.Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S.Chand, 2nd Edition, 2019.

2 D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009

3 M.S.Sukhija, T.K.Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.

4 Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.

5 L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.

6 E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

7 V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- I SEM

L	T	P	C
0	0	2	1

22CH107BS: ENGINEERING CHEMISTRY LABORATORY

Pre-requisites: Nil

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

1 Estimation of hardness of water to check its suitability for drinking purpose.
2 Students are able to perform estimations of acids and bases using conduct ometry, potentiometry and pH metry methods.
3 Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory
4 Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course out comes: The experiments will make the student gain skills on:

1 Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
2 Performing experimental methods such as conduc to metry, potentiometry and PHmetry in order to find out the concentration so equivalence points of acids and bases.
3 Preparation of polymers like Bakelite and nylon-6.
4 Estimation of saponification value, surface tension and viscosity of lubricant oils.
5 Estimation of different types of qualitative and quantitative measurements of a given compound

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		1			2					2		
CO2	2	2					2					2		
CO3	2	2				1	2					2		
CO4	3	2				2	2					2		
CO5	3	2		2								2		

List of Experiments:

I Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometry method.
II Conductometry: Estimation of the concentration of an acid by Conductometry.
III Potentiometry: Estimation of the amount of Fe+2 by Potentiomentry.
IV pH Metry: Determination of an acid concentration using pH meter.
V Preparations:
Preparation of Bakelite.
2. Preparation Nylon – 6.
VI Lubricants:
Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer
VII Corrosion: Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
VIII Virtual lab experiments

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

1 Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)

2 Vogel's text book of practical organic chemistry 5th edition

3 Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications

4 College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- I SEM **L T P C**

0 0 2 1

22EE108ES: C PROGRAMMING AND DATA STRUCTURES LABORATORY

Course Objectives: Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

Course out comes:

1 Develop modular and readable C Programs
2 Solve problems using strings, functions
3 Handle data in files
4 Implement stacks, queues using arrays, linked lists.
5 To understand and analyze various searching and sorting algorithms.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	0	-	-	-	-	2	3	-	-	2	1
CO2	2	-	2	0	2	-	-	-	2	3	-	-	2	-
CO3	-	-	2	0	2	-	-	-	2	3	-	-	2	3
CO4	2	2	-	-	2	-	-	-	2	3	-	-	2	3
CO5	2	2	-	2	-	-	-	-	2	3	-	-	-	3

List of Experiments:

1 Write a C program to find the sum of individual digits of a positive integer.
2 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.
3 Write a C program to generate the first n terms of the sequence.
4 Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
5 Write a C program to find the roots of a quadratic equation.
6 Write a C program to find the factorial of a given integer.
7 Write a C program to find the GCD (greatest common divisor) of two given integers.
8 Write a C program to solve Towers of Hanoi problem.
9 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)
10 Write a C program to find both the largest and smallest number in a list of integers.
11 Write a C program that uses functions to perform the following:
   i. Addition of Two Matrices
   ii. Multiplication of Two Matrices

12 Write a C program that uses functions to perform the following operations:
   i. To insert a sub-string in to a given main string from a given position.
   ii. To delete n Characters from a given position in a given string.

13 Write a C program to determine if the given string is a palindrome or not

14 Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.

15 Write a C program to count the lines, words and characters in a given text.

16 Write a C program to generate Pascal's triangle.

17 Write a C program to construct a pyramid of numbers.

18 Write a C program that uses functions to perform the following operations:
   i. Reading a complex number
   ii. Writing a complex number
   iii. Addition of two complex numbers

19 Write a C program which copies one file to another.
Write a C program to reverse the first n characters in a file. (Note: The file name and are specified on the command line.)
Write a C program to display the contents of a file.
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)

20 Write a C program that uses functions to perform the following operations on singly linked list.
i) Creation ii) Insertion iii) Deletion iv) Traversal

21 Write C programs that implement stack (its operations) using
i) Arrays ii) Pointers

22 Write C programs that implement Queue (its operations) using
i) Arrays ii) Pointers

23 Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
i) Bubble sort ii) Selection sort iii) Insertion sort

24 Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
i) Linear search ii) Binary search

TEXT BOOKS:

1 C Programming & Data Structures, B.A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.

2 Let us C, Yeswanth Kanitkar

3 C Programming, Balaguru swamy.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- II SEM **L T P C**

3 1 0 4

22MA201BS: ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn

1 Methods of solving the differential equations of first and higher order
2 Concept, properties of Laplace transforms.
3 Solving ordinary differential equations using Laplace transforms techniques.
4 The physical quantities involved in engineering field related to vector valued functions.
5 The basic properties of vector valued functions and their applications to line, surface and volume integrals.

Course out comes: After learning the contents of this paper, the student must be able to

1 Identify whether the given differential equation of first order is exact or not.
2 Apply the concept of differential equation to real world problems.
3 Apply the concept of differential equation to real world problems.
4 Use gradient to evaluate directional derivatives and conservative vector field.
5 Calculate the line, surface and volume integrals and converting them from one to another.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3		1	1							1		
CO2	1	2			2							2		
CO3	3	2		2										
CO4	2	1		2								1		
CO5	2	2										1		

UNIT-I: First Order ODE **8L**

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order **10L**

Second order linear differential equations with constant coefficients: Non-Homo generous terms of the type eax, sin ax, cos ax, polynomials in x, (x) and x (x), method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-III: Laplace transforms **10 L**

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications:

solving Initial value problems by Laplace Transform method

UNIT-IV: Vector Differentiation **10 L**

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 **10 L**

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

TEXT BOOKS:

1 B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2016.

2 R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 10th Edition, 2020.

RFERENCE BOOKS:

1 Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2018.

2 G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

3 H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

4 N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2018

5 S.L.Ross, differential equations 3rd edition, Wiley India, 2007.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- II SEM

L	T	P	C
3	1	0	4

22PH202BS: APPLIED PHYSICS

Pre-requisites: 10 + 2 Physics

Course Objectives: The objectives of this course for the student are to:

1. Understand the basic principles of quantum physics and band theory of solids
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nano scale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibres.

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

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nano materials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3			1						2		
CO2	2	1			1							2		
CO3	2	1			1							1		
CO4	3			2	2							2		
CO5	2	1			1				1			1		

UNIT-I: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Symmetry in solids, free electron theory (Drude& Lorentz, Sommerfeld) - Fermi-Dirac distribution

- Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids

UNIT-II: SEMICONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors -

construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT-III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials: Hysteresis - soft and hard magnetic materials - magnetostriction, magneto resistance - applications - bubble memory devices, magnetic field sensors and multiferroics. Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

UNIT-IV: NANOTECHNOLOGY

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical

vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials

UNIT-V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser , CO2 laser, Argon ion Laser, Nd:YAG laser- semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection-construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers-losses in optical fiber - optical fiber for communication system - applications.

TEXT BOOKS:

1 M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications, 11th Edition 2019

2 Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication, 2019

3 Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4th Edition, 2021.

4 B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022.

5 Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

RFERENCE BOOKS:

1 Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.

2 Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons, 11th Edition, 2018.

3 Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.

4 Elementary Solid-State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.

5 A.K. Bhandhopadhya - Nano Materials, New Age International, 1st Edition, 2007.

6 Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group Energy Materials Taylor & Francis Group, 1st Edition, 2022

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- II SEM	**L**	**T**	**P**	**C**
	0	**1**	**3**	**2.5**

22ME203ES: ENGINEERING WORKSHOP

Pre-requisites: Practical skill

Course Objectives:

1 To Study of different hand 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 hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
4 To develop a right attitude, team working, precision and safety at work place.
5 It explains the construction, 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 Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances

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

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

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1						2	1		1		
CO2	2	2	1						2	1		1		
CO3	2	1	1						2	1		1		
CO4	2	1	1						2	1		1		
CO5	2	2	1						2	1		1		

1. TRADES FOR EXERCISES:

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 – (Square Tin, Rectangular Tray & Conical Funnel)
IV Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
V Welding Practice – (Arc Welding & Gas Welding)

VI House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII Black Smithy – (Round to Square, Fan Hook and S-Hook)

2 **TRADES FOR DEMONSTRATION & EXPOSURE:**
Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXT BOOKS:

1 Workshop Practice /B. L. Juneja / Cengage

2 Workshop Manual / K. Venugopal / Anuradha

RFERENCE 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- II SEM

L	T	P	C
2	0	0	2

22EN204HS: ENGLISH FOR SKILL ENHANCEMENT

Course Objectives: This course will enable the students to:

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

Course Outcomes: Students will be able to:

1. Understand the importance of vocabulary and sentence structures
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3			3	3		3		
CO2						2			3	3		3		
CO3						3			2	3		3		
CO4						2			3	3		2		
CO5						3			2	3		3		

UNIT - I

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

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

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

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

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

UNIT - II

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

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement

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

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

UNIT - III

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

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

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

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice

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

UNIT - IV

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

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

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

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

UNIT - V

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

Vocabulary: Technical Vocabulary and their Usage

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

Reading: Reading Comprehension-Exercises for Practice

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

Note: ***Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.***

- **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended***, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class
- **Note**: **2**. based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents. They are advised

to teach 40 percent of each topic from the syllabus in blended mode.

TEXT BOOK:

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

REFERENCE BOOKS:

1 Effective Academic Writing by Liss and Davis (OUP)
2 Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3 Wood,F.T. (2007). Remedial English Grammar. Macmillan.
4 Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5 (2019). Technical Communication. Wiley India Pvt. Ltd.
6 Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7 Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- II SEM

L	T	P	C
2	0	0	2

22EE205ES: ELECTRICAL CIRCUIT ANALYSIS – II

Prerequisites: Mathematics

Course Objectives:

1 To study the transient analysis of various R, L and C circuits for different inputs
2 To understand the Fourier series and Laplace transformation.
3 To learn about two-port networks and concept of filters.

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

1 Observe the response of various R,L and C circuits for different excitations.
2 Design transfer function and know the response of different sinusoidal excitations
3 Design two port network parameters and solve different parameter functions
4 Examine the behavior of circuits using Fourier and integral series for simple networks
5 Design and classify various types of filters.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	1	2	1	1	2	3	3
CO2	3	3	3	3	3	3	3	3	3	3	2	3	3	3
CO3	3	2	2	2	3	3	3	2	1	3	3	2	3	2
CO4	2	2	2	3	2	2	2	1	2	2	1	3	2	2
CO5	3	2	3	2		1	2	1	1	2	1	3	3	2

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

Fourier Series and Integral: Fourier series representation of periodic functions, Symmetry conditions, Exponential Fourier series, Discrete spectrum, Fourier integral and its properties, Continuous spectrum, Application to simple networks

UNIT - V

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

TEXT BOOK:

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

REFERENCE BOOKS:

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

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- II SEM

L	T	P	C
0	1	2	2

22EE206ES: APPLIED PYTHON PROGRAMMING LABORATORY

Course Outcomes: Upon completing this course, the students will be able to

1 Build basic programs using fundamental programming constructs
2 Write and execute python codes for different applications
3 Capable to implement on hardware boards
4 Understand Strings, Lists, Tuples and Dictionaries in Python
5 Verify programs using modular approach, file I/O, Python standard library

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	1	1	-	-	1	-	1	1	2	2
CO2	2	3	2	1	1	2	-	-	1	-	1	1	2	2
CO3	2	3	2	1	1	2	-	-	1	-	1	1	1	1
CO4	2		2		2				2	3		2	2	
CO5			2		2				2	3			2	3

LIST OF EXPERIMENTS:

Cycle - 1

1 Downloading and Installing Python and Modules

a. Python 3 on Linux
Follow the instructions given in the
URL https://docs.python- guide.org/starting/install3/linux/

b. Python 3 on Windows
Follow the instructions given in the
URL https://docs.python.org/3/using/windows.html
(Please remember that Windows installation of Python is harder!)

c. pip3 on Windows and Linux Install the Python package installer by following the instructions given in the
URL https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/

d. Installing numpy and scipy
You can install any python3 package using the command pip3 install <packagename>

e. Installing jupyterlab
Install from pip using the command pip install jupyterlab

2 Introduction to Python3

a. Printing your biodata on the screen
b. Printing all the primes less than a given number
c. Finding all the factors of a number and show whether it is a *perfect* number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself

3 Defining and Using Functions
   a. Write a function to read data from a file and display it on the screen
   b. Define a boolean function *is palindrome*(<input>)
   c. Write a function *collatz(x)* which does the following: if *x* is odd, *x = 3x + 1*; if *x* is even, then *x = x/2*. Return the number of steps it takes for *x* = 1
   d. Write a function *N(m, s) = exp(-(x-m)2/(2s2))/sqrt(2π)s* that computes the Normal distribution

4 The package numpy
   a. Creating a matrix of given order *m x n* containing *random numbers* in the range 1 to 99999
   b. Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed
   c. Write a program to solve a system of *n* linear equations in *n* variables using matrix inverse

5 The package scipy and pyplot
   a. Finding if two sets of data have the same *mean* value
   b. Plotting data read from a file
   c. Fitting a function through a set a data points using *polyfit* function
   d. Plotting a histogram of a given data set

6 The strings package
   a. Read text from a file and print the number of lines, words and characters
   b. Read text from a file and return a list of all *n* letter words beginning with a vowel
   c. Finding a secret message hidden in a paragraph of text
   d. Plot a histogram of words according to their length from text read from a file

Cycle -2

7 Installing OS on Raspberry Pi
   a. Installation using PiImager
   b. Installation using image file
      - Downloading an Image
      - Writing the image to an SD card
      - using Linux
      - using Windows
      - Booting up

   Follow the instructions given in the URL
   https://www.raspberrypi.com/documentation/computers/getting-started.html

8 Accessing GPIO pins using Python

   a. Installing GPIO Zero library.

   First, update your repositories list:
   sudo apt update
   Then install the package for Python 3:
   sudo apt install python3-gpiozero

   b. Blinking an LED connected to one of the GPIO pin

c. Adjusting the brightness of an LED

Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength

9 Collecting Sensor Data

a. DHT Sensor interface

a. Connect the terminals of DHT GPIO pins of Raspberry Pi.

b. Import the DHT library using *import Adafruit_DHT*

c. Read sensor data and display it on screen

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- II SEM

L	**T**	**P**	**C**
0	**0**	**3**	**1.5**

22PH207BS: APPLIED PHYSICS LABORATORY

Course Objectives: The objectives of this course for the student to

1 Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2 Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials
3 Able to measure the characteristics of dielectric constant of a given material.
4 Study the behavior of B-H curve of ferromagnetic materials.
5 Understanding the method of least squares fitting.

Course Outcomes: The students will be able to:

1 Able to study the (V-I/P-I) characteristics of LED, LASER and Solar cell.
2 Able to understand the energy gap of semiconductor diode
3 Correlate the theory of Hall Effect with experiment by determining the Hall coefficient.
4 Examine the Bending losses for different Optical fiber cables.
5 Able to understand various concepts-Resonance, Time constant and Magnetic field using LCR, RC, Stewart and Gees circuits.

Cos	**PROGRAMME OUTCOMES**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		1		2				2			2		
CO2	2		1		1				2			2		
CO3	2			1	2				1			2		
CO4	2		2		1							2		
CO5	2	2	2									2		

LIST OF EXPERIMENTS:

1 Determination of work function and Planck's constant using photoelectric effect.
2 Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3 Characteristics of series and parallel LCR circuits.
4 V-I characteristics of a p-n junction diode and Zener diode
5 Input and output characteristics of BJT (CE, CB & CC configurations)
6 a) V-I and L-I characteristics of light emitting diode (LED)
b) V-I Characteristics of solar cell
7 Determination of Energy gap of a semiconductor
8 Determination of the resistivity of semiconductor by two probe method
9 Study B-H curve of a magnetic material.
10 Determination of dielectric constant of a given material
11 a) Determination of the beam divergence of the given LASER beam
b) Determination of Acceptance Angle and Numerical Apertureof an optical fiber.
12 Understanding the method of least squares – torsional pendulum as an example.

Note: *Any 8 experiments are to be performed.*

REFERENCE BOOKS:

1 S. Balasubramanian, M.N. Srinivasan “A Text book of Practical Physics”- S Chand Publishers, 2017.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- II SEM

L	T	P	C
0	0	2	1

22EN208HS: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives: The objectives of this course for the student to

1 To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2 To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3 To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4 To improve the fluency of students in spoken English and neutralize the impact of dialects.
5 To train students to use language appropriately for public speaking, group discussions 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 Understand how to use language to make formal presentations
5 Interprets speaking skills with clarity and confidence which in turn enhances their inter personal skills.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					3	2			3	3		3		
CO2					3	3			3	3		3		
CO3						3			3	3		3		
CO4					3				3	3		3		
CO5									3	3		3		

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Listening Skills:

Objectives

1 To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2 To equip students with necessary training in listening, so that they can comprehend the

speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab**. **Exercise – I**

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. *Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

ICS Lab:

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

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

Exercise – II CALL Lab:

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

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

ICS Lab:

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

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

Exercise - III CALL Lab:

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

Practice: Common Indian Variants in Pronunciation – Differences between British and

American Pronunciation -*Testing Exercises*

ICS Lab:

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

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

Exercise –

IV CALL

Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests - Testing Exercises

ICS Lab:

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

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

Exercise –

V CALL

Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:

Understand: Group Discussion

Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

1 **Computer Assisted Language Learning (CALL) Lab:**

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i. Computers with Suitable Configuration
ii. High Fidelity Headphones

2 **Interactive Communication Skills (ICS) Lab :**

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio- visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

Source of Material (Master Copy):

- Exercises in Spoken English. Part 1,2,3. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley

- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge. University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS:

1 (2022). English Language Communication Skills – Lab Manual cum Workbook. Cengage Learning India Pvt. Ltd.
2 Shobha, KN&Rayen, J. Lourdes. (2019). Communicative English – A workbook. Cambridge University Press
3 Kumar, Sanjay & Lata, Pushp. (2019). Communication Skills: A Workbook. Oxford University Press
4 Board of Editors. (2016). ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities. Orient Black Swan Pvt. Ltd.
5 Mishra, Veerendra et al. (2020). English Language Skills: A Practical Approach. Cambridge University Press

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- II SEM

L	T	P	C
0	0	2	1

22EE209ES: ELECTRICAL CIRCUIT ANALYSIS LABORATORY

Prerequisites: Elements of Electrical Engineering & Electrical Circuit Analysis

Course Outcomes:

1 To design electrical systems and analyze them by applying various Network Theorems
2 To measure three phase Active and Reactive power.
3 To understand the locus diagrams and concept of resonance.

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

1 Analyze complex DC and AC linear circuits
2 Apply concepts of electrical circuits across Engineering.
3 Evaluate response of a given network by using theorems.
4 Analyze two-port network behavior
5 Construct and analyze locus diagrams for RL, RC and RLC networks

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2	1	2	1	2	1	2	3	2	1
CO2	2	1	2	2	2	1	2	1	2	1	2	2	2	1
CO3	2	2	2	2	2	1	1	1	1	1	2	2	2	2
CO4	2	1	2	2	2	1	1	1	1	1	2	1	2	1
CO5	2	1	2	2	2	1	1	1	1	1	2	1	2	1

The following experiments are required to be conducted as compulsory

1 To draw the locus Diagrams of RL (R-Varying) and RC (R-Varying) Series Circuits.
2 Verification of Series and Parallel Resonance.
3 Determination of Time response of first order RL and RC circuit for Periodic non – sinusoidal inputs – Time Constant and Steady state error.
4 Determination of Two port network parameters – Z & Y parameters.
5 Determination of Two port network parameters – A, B, C, D parameters.
6 Determination of Co-efficient of Coupling and Separation of Self and Mutual inductance in a Coupled Circuits.
7 Frequency domain analysis of Low-pass filters.
8 Frequency domain analysis of Band-pass filters.

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

1 Harmonic Analysis of non-sinusoidal waveform signals using Harmonic Analyzer and plotting frequency spectrum
2 Measurement of Active Power for Star and Delta connected balanced loads.
3 Measurement of Reactive Power for Star and Delta connected balanced loads.
4 Frequency domain analysis of High-pass filter.
5 Determination of Two port network parameters -Hybrid parameters.
6 To draw the locus Diagrams of RL (L-Varying) and RC (C-Varying) Series Circuits

TEXT BOOK:

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

REFERENCE BOOKS:

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

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

I YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	0

22MC210: 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: The students should be able to:

1 Know basic concept of ecological perspective and the value of the environment.
2 Understand 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, Discover effective methods of waste management and come out with best possible solutions.
5 Raise awareness about environmental laws and sustainable development.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	2			3	3	2			1	1		
CO2						1	3	2				1		
CO3		2	3			2	2	2				1		
CO4		1	1			3	3	2			1	2		
CO5						2	2	3				2		
AVG.		1.3	2			2.2	2.6	2.2			1	1.4		

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 magnification, 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: Wastewater 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.

TEXT BOOK:

1 Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha 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, 4th Edition, 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

I YEAR B.TECH. EEE- II SEM **L T P C**

3 1 0 4

22MA301BS: NUMERICAL METHODS AND COMPLEX VARIABLES

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn

1 Expressing periodic function by Fourier series and a non-periodic function by Fourier transforms
2 Various numerical methods to find roots of polynomial and transcendental equations.
3 Concept of finite differences and to estimate the value for the given data using interpolation.
4 Evaluation of integrals using numerical techniques
5 Solving ordinary differential equations of first order using numerical techniques
6 Differentiation and integration of complex valued functions.
7 Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem
8 Expansion of complex functions using Taylor's and Laurent's series.

Course Outcomes: After learning the content soft his paper, the student must be able to

1 Express any periodic function in terms of sine and cosine
2 Find the root of a given poly nominal and transcendental equations and estimate the value for the given data using interpolation
3 Find the numerical solutions for a given first order ODEs
4 Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems and transformations on different planes.
5 Apply Taylor's and Laurent' series expansions in complex function.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2			2							1		
CO2	2	1			2							1		
CO3	2	2			1							1		
CO4	1	2		2								1		
CO5	1	2										1		

UNIT-I: Fourier Series &Fourier Transforms: **10L**

Fourier series - Dirichlet's Conditions - Half-range Fourier series - Fourier Transforms: Fourier Sine and cosine transforms - Inverse Fourier transforms.

UNIT-II: Numerical Methods-I **10 L**

Solution of polynomial and transcendental equations: Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method. Jacobi and Gauss-Seidal iteration methods for solving linear systems of equations.

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 Methods-II **8 L**

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

UNIT-IV: Complex Differentiation **10 L**

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties. (All theorems without Proofs), Conformal mappings, Mobius transformations

UNIT-V: Complex Integration: **10 L**

Line integrals, Cauchy's theorem, Cauchy's Integral formula, zeros of analytic functions, singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem.
and their properties. (All theorems without Proofs)

TEXT BOOK:

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.

REFERENCE BOOKS:

1 M. K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations, New Age International publishers.
2 Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3 J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill, 2004.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- I SEM

L	T	P	C
3	1	0	4

22EE301PC: ELECTRICAL MACHINES - I

Pre-requisites: Electrical Circuit Analysis-1 & Electrical Circuit Analysis-2

Course Objectives:

1 To study and understand different types of DC machines and their performance evaluation through various testing methods.
2 To understand the operation of single and ploy-phase Transformers
3 To analyze the performance of transformers through various testing methods.

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

1 Illustrate different parts of a DC machine & its operation
2 Use the testing methods to predetermine the efficiency of DC machines
3 Analyze different excitations and starting methods of DC machines
4 Construct the single phase and three phase transformer circuits
5 Calculate the performance of Transformers

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1			1		1			1	1	2	2
CO2	3	2	1	1	1			1	1	1	1	1	3	2
CO3	2	1		1		1		1		1		1	2	1
CO4	2	1	1	1	1	1	1	1	1	1	1	1	2	1
CO5	2	2	1	1				1	1			1	2	2

UNIT-I:

D.C. GENERATORS: Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E. M.F Equation.

Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation.

Methods of Excitation – separately excited and self-excited generators – build-up of E.M.F - critical field resistance and critical speed - causes for failure to self-excited and remedial measures. Load characteristics and applications of shunt, series and compound generators.

UNIT-II:

D.C MOTORS: Principle of operation – Back E.M.F. - Torque equation – characteristics and application of 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 – condition for maximum efficiency.

UNIT-III:

TESTING OF DC MACHINES: Methods of Testing – direct, indirect, and regenerative testing – Brake test – Swinburne's test – Hopkinson's test –Field's test - separation of stray losses in a D.C. motor test.

UNIT-IV:

SINGLE PHASE TRANSFORMERS: Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no load and on load - phasor diagrams and Applications.

Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency &supply voltage on iron losses.

UNIT-V:

TESTING OF TRANSFORMERS AND POLY-PHASE TRANSFORMERS: Open Circuit and Short Circuit tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses test- parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers.

Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Scott connection and Applications.

TEXT BOOK:

1 P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2 J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

REFERENCE BOOKS:

1 Prithwiraj Purkait, Indrayudh Bandyopadhyay, "Electrical Machines", Oxford, 2017.
2 M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3 A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
4 A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- I SEM

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

22EE302PC: POWER SYSTEM - I

Pre-requisites: Electrical Circuit Analysis-1 & Electrical Circuit Analysis-2 Electrical Machines-I & Electrical Machines-II

Course Objectives:

1 To understand the power generation through conventional and non-conventional sources.
2 To illustrate the economic aspects of power generation and tariff methods.
3 To know about overhead line insulators, substations and AC & DC distribution systems.

Course Outcomes: After learning the contents of this paper the student must 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.

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1		1	1	1		1		1
CO2	2	2	1	1	1	1	1	1	1	1	1	1
CO3	2	2	1	1		1		1		1		1
CO4	2	2	1	1		1	1	1	1	1	1	1
CO5	2	1	1	1	1	1	1	1	1	1	1	1

UNIT-I:

GENERATION OF ELECTRIC POWER:

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

Non-Conventional Sources (Elementary Treatment):

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

UNIT-II:

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

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

UNIT-III:

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

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

UNIT-IV:

SUBSTATIONS:

AIR INSULATED SUBSTATIONS (AIS): Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

GAS INSULATED SUBSTATIONS (GIS): Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT-V:

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

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

TEXT BOOK:

1 C.L. Wadhwa, “Generation, Distribution and Utilization of Electrical Energy”, 2 n d Edition, New AgeInternational, 2009.
2 V.K Mehta andRohit Mehta, “Principles of Power Systems”, S. Chand & Company Ltd, New Delhi, 2004.

REFERENCE BOOKS:

1 A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, “A Text book on Power System Engineering”, Dhanpat Rai Publishing Company (P) Ltd, 2008.
2 C.L. Wadhwa, “Electrical Power Systems”, 5th Edition, New Age International, 2009.
3 M.V. Deshpande, “Elements of Electrical Power Station Design”, 3rd Edition, Wheeler Pub. 1998.
4 H.Cotton & H. Barber, “The Transmission and Distribution of Electrical Energy”, 3rd Edition, 1970.
5 W.D.Stevenson, “Elements of Power System Analysis”, 4th Edition, McGraw Hill, 1984

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- I SEM

L	T	P	C
3	0	0	3

22EC310PC: ANALOG ELECTRONIC CIRCUITS

Course Objectives:

1 To introduce components such as diodes, BJTs and FETs their switching characteristics, applications
2 Learn the concepts of high frequency analysis of transistors.
3 To give understanding of various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned 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: Upon completing this course, the students will be able to

1 Know the characteristics, utilization of various components
2 Understand the biasing techniques
3 Design and analyze various rectifiers, small signal amplifier circuits.
4 Design sinusoidal and non-sinusoidal oscillators.
5 Designs OP-AMP based circuits with linear integrated circuits

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	-	-	-	-	2	-	2
CO2	3	2	2	1	1	-	-	-	-	2	-	2
CO3	3	2	2	2	1	-	-	-	-	1	-	2
CO4	3	2	1	1	1	-	-	-	-	1	-	1
CO5	3	2	1	1	1	-	-	-	-	1		1

UNIT-I:

Diode and Bipolar Transistor 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, biasing circuits, Load line analysis, common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits

UNIT-II:

FET Circuits: FET Structure and VI Characteristics, MOSFET structure and I-V characteristics. MOSFET as a switch. small signal equivalent circuits - gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, trans conductance, high frequency equivalent circuit.

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 characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC 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.

TEXT BOOK:

1 Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education, 2ndedition 2010
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. Grabel, “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 IntegratedCircuits”, John Wiley & Sons, 2001

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- I SEM

L	T	P	C
3	0	0	3

22EE303PC: ELECTROMAGNETIC FIELDS

Pre-requisites: Mathematics & Applied Physics

Course Objectives:

1 To introduce the concepts of electric field and magnetic field.
2 To know Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.
3 To study about electromagnetic waves.

Course Outcomes: After learning the contents of this paper the student must be able 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.

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	2	1	1	1	2
CO2	3	3	3	3	3	3	2	1	1	1	3	1
CO3	3	2	2	2	3	3	3	1	1	3	3	1
CO4	3	3	3	2	3	2	0	0	0	1	1	1
CO5	3	2	3	2	2	2	3	1	1	2	1	1

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 andits 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. Poynting theorem.

TEXT BOOK:

1 M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014
2 W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.

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.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- I SEM

L	T	P	C
0	0	2	1

22EE304PC: ELECTRICAL MACHINES LABORATORY – I

Pre-requisites: Electrical Machines- I

Course Objectives:

1 To expose the students to the operation of DC Generators
2 To know the operation of various types of DC Motors
3 To examine the performance of Single and Three Phase Transformers

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

1 Start and control the Different DC Machines.
2 Assess the performance of different machines using different testing methods
3 Evaluate the performance of different Transformers using different testing methods
4 Determine the performance characteristics of DC shunt and DC compound generators by conducting load tests.
5 Demonstrate No-load/magnetization characteristics of DC and AC motors

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	1	2	1	1	2
CO2	3	3	3	3	3	3	3	3	3	3	2	3
CO3	3	2	2	2	3	3	3	2	1	3	3	2
CO4	3	2	2	2	2	2	3	2	1	3	3	2
CO5	3	2	2	2	2	2	3	2	1	3	3	2

The following experiments are required to be conducted compulsory experiments:

1 Magnetization characteristics of DC shunt generator (Determination of critical field resistance and critical speed)
2 Load test on DC shunt generator (Determination of characteristics)
3 Load test on DC series generator (Determination of characteristics)
4 Hopkinson's test on DC shunt machines (Predetermination of efficiency)
5 Swinburne's test and speed control of DC shunt motor (Predetermination of efficiencies)
6 Brake test on DC compound motor (Determination of performance curves)
7 OC and SC Test on Single Phase Transformer
8 Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star- Delta, Delta-Delta, Delta-star, Star-Star)

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 Load test on DC compound generator (Determination of characteristics.
3 Fields test on DC series machines (Determination of efficiency)
4 Retardation test on DC shunt motor (Determination of losses at rated speed)
5 Separation of losses in DC shunts motor.
6 Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a

Single-Phase Transformer

7 Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)

TEXT BOOK:

1 P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.

2 I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

REFERENCE BOOKS:

1 Prithwiraj Purkait, Indrayudh Bandyopadhyay, “Electrical Machines”, Oxford, 2017.

2 M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.

3 A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.

4 A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- I SEM

L	T	P	C
0	0	2	1

22EC311PC: ANALOG ELECTRONIC CIRCUITS LABORATORY

Pre-requisites: Analog Electronic Circuits

Course Objectives:

1 To introduce components such as diodes, BJTs and FETs their switching characteristics, applications
2 Learn the concepts of high frequency analysis of transistors.
3 To give understanding of various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned 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 Know the characteristics, utilization of various components.
2 Understand the biasing techniques
3 Design and analyze various rectifiers, small signal amplifier circuits
4 Design sinusoidal and non-sinusoidal oscillators.
5 Design OP-AMP based circuits with linear integrated circuits

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2					2		3
CO2	3	3	3	2	2					2		3
CO3	3	3	3	2	2					2		3
CO4	3	3	3	2	2					2		3
CO5	3	3	3	2	2					2		3

List of Experiments:

1 Draw the VI Characteristics of given PN Junction diode. Determine the Static and Dynamic resistance of the Diode
2 Determine the Ripple factor, %Regulation PIV and TUF of the given Rectifier with & without filter.
3 Obtain the I/O Characteristics of CE configurations of BJT. Calculate h-parameters from the Characteristics.
4 Obtain the I/O Characteristics of CB configurations of BJT. Calculate h-parameters from the Characteristics.
5 Obtain the I/O Characteristics of CC configurations of BJT. Calculate h-parameters from the Characteristics.
6 Obtain the Drain and Transfer characteristics of CD,CS configuration of JFET. Calculate gm, rd from the Characteristics Adder and Subtractor using Op Amp.
7 Inverting and Non-inverting Amplifiers using Op Amps
8 Adder and Subtractor using Op Amp

9	Integrator Circuit using IC 741.
10	Differentiator circuit using Op Amp.
11	Current Shunt Feedback amplifier
12	Design an RC phase shift oscillator circuit and derive the gain condition for oscillations practically for given frequency.
13	Design a Colpitts oscillator circuit for the given frequency and draw the output waveform
14	Design transformer coupled class A power amplifier and draw the input and output waveforms, find its efficiency

- Experiments related to MOSFET may be included

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II YEAR B.TECH. EEE- I SEM

L	T	P	C
0	0	2	1

22EE305PC: ELECTRICAL SIMULATION TOOLS LABORATORY

Course Objectives:

1 To understand basic block sets of different simulation platform used in electrical/electronic circuit design
2 To understand use and coding in different software tools used in electrical/ electronic circuit design
3 To understand the simulation of electric machines/circuits for performance analysis.

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

1 Develop knowledge of software packages to model and program electrical and electronics systems.
2 Model different electrical and electronic systems and analyze the results.
3 Articulate importance of software packages used for simulation in laboratory experimentation by analyzing the simulation results.
4 Modeling and analysis of equivalent circuit of transformer, bridge rectifier and voltage regulator using suitable simulation tools.
5 Modeling of transmission lines and performance analysis of solar PV model using suitable simulation tools.

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	3	2	3	2	3	1	2	2	3
CO2	3	2	2	1	2	1	2	1	2	2	2	3
CO3	3	2	0	0	2	0	1	0	2	0	2	3
CO4	3	3	2	2	2	1	1	0	1	0	2	2
CO5	3	3	2	2	3	2	2	1	2	1	2	3

Students should be encouraged to use open-source software's such as **SCILAB, ORCAD, LTSPICE, Ngspice, Octave, Solve Elec, Simulide, Circuit Lab, QElectroTech, Circuit Sims, DcAc Lab, Every Circuit, DoCircuits**etc. for carrying out the lab simulation listed below.

Use of Professional Licensed versions of softwares **like MATLAB, LabVIEW, NI Multisim, PSpice, PowerSim, TINA** etc. is also allowed**.**

Use of **'Python'** platform for simulating components/ circuit behaviour.

Suggested List of Laboratory Experiments:

The following experiments need to be performed from various subject domains.

1 Introduction to basic block sets of simulation platforms. Basic matrix operations, Generation of standard test signals
2 Solving the linear and nonlinear differential equations
3 Measurement of Voltage, Current and Power in DC circuits.
4 Verification of different network theorems with dependent and independent sources using suitable simulation tools.

5	Verification of performance characteristics of basic Electronic Devices using suitable simulation tools.
7	Obtaining the response of electrical network for standard test signals using suitable simulation tools.
8	Modeling and Analysis of Low pass and High pass Filters using suitable simulation tools
9	Performance analysis of DC motor using suitable simulation tools
10	Modeling and analysis of Equivalent circuit of transformer using suitable simulation tools.
11	Analysis of single-phase bridge rectifier with and without filter using suitable Simulation tools.
12	Modeling and Verification of Voltage Regulator using suitable simulation tools.
13	Modeling of transmission line using simulation tools.
14	Performance analysis of Solar PV model using suitable simulation tools

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- I SEM	**L**	**T**	**P**	**C**
	0	**0**	**2**	**0**

22MC309: 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 programmes 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.

Objectives of the Course

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.

Learning Outcomes

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 labor 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.

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	0	0	0	0	2	0	1	0	0	0	0
CO2	0	0	0	0	0	2	0	1	0	0	0	0
CO3	0	0	0	0	0	2	0	1	0	0	0	0
CO4	0	0	0	0	0	2	0	1	0	0	0	0
CO5	0	0	0	0	0	2	0	1	0	0	0	0

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 LABOUR

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.

Note**: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of** English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

- *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".*
- ✓ **ESSENTIAL READING**: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender"* written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama

Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- II SEM

L	T	P	C
3	1	0	4

22CE401ES: SOLID MECHANICS AND HYDRAULIC MACHINES

Course Objectives:

1 To identify an appropriate structural system and work comfortably with basic engineering mechanics and types of loading & support conditions that act on structural systems.
2 To understand the meaning of centers of gravity, centroids, moments of Inertia and rigid body dynamics.
3 To Study the characteristics of hydroelectric power plant and Design of hydraulic machinery.

Course Outcomes: After learning the contents of this paper the student must 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 Centre of Gravity and simple stresses and strains.
3 Solve problem on kinematics and kinetics of particles
4 Illustrate details of Hydraulic machinery.
5 Illustrate details of turbines and pumps

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3	2	2	1	1				1			1		
CO2	3	2	2	1	1				1			1		
CO3	3	2	2	1	1				1			1		
CO4	3	2	2	1	1				1			1		
CO5	3	2	2	1	1				1			1		

UNIT-I:

INTRODUCTION OF ENGINEERING MECHANICS: Basic concepts of System of Forces-Coplanar Forces–Components in Space–Resultant- Moment of Forces andits Application – Couples and Resultant of Force System-Equilibrium of System of Forces-Free body diagrams-Direction of Force Equations of Equilibrium of Coplanar Systems and Spatial Systems – Vector cross product-Support reactions different beams for different types of loading – concentrated, uniformly distributedand uniformly varying loading. Types of friction – Limiting friction – Laws of Friction – static and Dynamic Frictions – Angle of Friction –Cone of limiting friction

UNIT-II:

CENTROID AND CENTER OF GRAVITY: Centroids – Theorem of Pappus- Centroids of Composite figures – Centre of Gravity of Bodies – Area momentof Inertia:–polar Moment of Inertia–Transfer– Theorems - Moments of Inertia of Composite Figures.

SIMPLE STRESSES AND STRAINS ANALYSIS: Concept of stress and strain- St. Venant's Principle- Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains-Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Pure shear and Complementary shear - Elastic modulii, Elasticconstants and the relationship between them

UNIT-III:

KINEMATICS & KINETICS: Introduction – Rectilinear motion – Motion with uniform and variable acceleration–Curvilinear motion– Components of motion– Circular motion Kinetics of a particle – D'Alembert's principle – Motion in a curved path – work, energy and power. Principleof conservation of energy – Kinetics of a rigid body in translation, rotation – work done – Principle of work-energy – Impulse-momentum

UNIT-IV:

BASICS OF HYDRAULIC MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency Elements of a typical Hydropower installation – Heads and efficiencies

UNIT-V:

TURBINES & PUMPS: Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube
– Classification, functions and efficiency. Governing of turbines, Performance of turbines
Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel

TEXT BOOK:

1 M.V. Seshagirirao and Durgaih, "Engineering Mechanics",University Press.
2 P.N Modi and Seth, "Fluid Mechanics and Hydraulic Machinery", standard Book House

REFERENCE BOOKS:

1 B. Bhattacharya, "Engineering Mechanics", Oxford University Publications.
2 Hibbler, "Engineering Mechanics (Statics and Dynamics)", Pearson Education
3 Fedrinand L. Singer, " Engineering Mechanics" Harper Collings Publishers.
4 A.K.Tayal, "Engineering Mechanics" , Umesh Publication
5 Domkundwar & Domkundwar, "Fluid mechanics & Hydraulic Machines", Dhanpat Rai & C
6 R.C.Hibbeler, "Fluid Mechanics", Pearson India Education Servieces Pvt. Ltd
7 D.S.Kumar, "Fluid Mechanic & Fluid Power Engineering", Kataria & Sons Publications Pvt. Ltd.
8 Banga & Sharma, "Hydraulic Machines" Khanna Publishers.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- II SEM

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22EE401PC: MEASUREMENTS AND INSTRUMENTATION

Prerequisites: Electrical Circuit Analysis-1 & Electrical Circuit Analysis-2, Analog Electronics Electro Magnetic Fields.

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 understand the basic concepts of smart and digital metering

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

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

Cos	**PROGRAMME OUTCOMES**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3	3	2	2	1	1	1	2	1	1	1	2	3	3
CO2	3	2	2	2	2	1	1	2	2	1	1	2	3	2
CO3	3	3	3	3	2	1	1	2	1	1	2	2	3	3
CO4	3	3	3	3	1	1	1	2	1	1	1	2	3	3
CO5	3	2	1	1	2	1	1	2	1	1	1	2	3	2

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 element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced 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 –Desaunty'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; Principle 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 photo diodes.

INTRODUCTION TO SMART AND DIGITAL METERING: Digital Multi-meter, True RMS meters, Clamp- on meters, Digital Energy Meter, Cathode Ray Oscilloscope, Digital Storage Oscilloscope

TEXT BOOK:

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

2 Dr. Rajendra Prasad, "Electrical Measurements & Measuring Instruments", Khanna Publishers 1989.

REFERENCE BOOKS:

1 G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016.

2 R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd.,2007.

3 S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012

4 Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.

5 Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.

6 E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifth Edition,Wheeler Publishing, 2011.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- II SEM

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3	0	0	3

22EE402PC: ELECTRICAL MACHINES – II

Prerequisites: Electrical Circuit Analysis-1 & Electrical Circuit Analysis-2 & Electrical Machines-I

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

Course Outcomes: After learning the contents of this paper the student must 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.

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	1	1	1	0	0	1
CO2	3	2	2	2	2	2	1	1	1	0	0	1
CO3	3	3	2	3	3	2	2	1	1	1	2	2
CO4	3	2	2	2	2	2	1	1	1	0	1	1
CO5	3	3	3	2	2	2	1	1	1	0	1	2

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. Rotor power input, rotor copper loss and mechanical power developed and their inter relation.

UNIT-II:

CHARACTERISTICS OF INDUCTION MACHINES: 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, Applications.

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 and Applications.
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 MACHINES: Single phase induction motor – Constructional Features-Double revolving field theory – split-phase motors – AC series motor- Universal Motor- -Shadedpole motor and Applications.

TEXT BOOK:

1 P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011
2 I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

REFERENCE BOOKS:

1 Prithwiraj Purkait, Indrayudh Bandyopadhyay, "Electrical Machines", Oxford, 2017.
2 M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3 A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
4 A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- II SEM

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22EC409PC: DIGITAL ELECTRONICS

Prerequisites: Analog Electronics

Course Objectives:

1 To learn fundamental concepts of digital system design and common forms of number representations and their conversions
2 To implement and design logical operations using combinational logic circuits and sequential logic circuits.
3 To understand the semiconductor memories and programmable logic devices

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

1 Apply the concepts of logic gates in solving various problems
2 Analyze Combinational logic circuits in real time applications
3 Distinguish the working principle of various Sequential logic circuits
4 Design the N bit UP/DOWN Counters using flip flops
5 Implement the given logical problems using programmable logic devices.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3	2	3	1	2	1	-	-	-	-	-	2	2	
CO2	3	2	2	1	2	1	-	-	-	-	-	2	2	
CO3	2	3	3	2	2	1	-	-	-	-	-	1	2	
CO4	3	2	1	1	1	-	-	-	-	-	-	-	1	
CO5	2	2	2	1									1	

UNIT-I:

Fundamentals of Digital Systems and Logic Families: 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.

UNIT-II:

Combinational Circuits-I: 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

UNIT-III:

Combinational Circuits-II: Adders, Subtractors, Carry look ahead adder, Digital comparator, Parity checker/generator, Code converters, Priority encoders, Decoders/Drivers for display devices, Q-M method of function realization.

UNIT-IV:

Sequential Circuits: Introduction to flip-flops, SR, JK, T and D type's flip-flops, Shift registers,

Conversion of flip-flops, Ring counter, Ripple (Asynchronous) counters, Synchronous counters.

UNIT-V:

Semiconductor Memories and Programmable Logic Devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read-only memory (ROM), ROM types, Read and write memory (RAM) types, Programmable logic array, Programmable array logic, Field Programmable Gate Array (FPGA).

TEXT BOOK:

1 A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2 M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCE BOOKS:

1 R.S. Sedha, “A Textbook of Digital Electronics”, S.Chand, 2005
2 R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- II SEM

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22EE403PC: POWER SYSTEMS - II

Prerequisites: Power Systems –I & Electro Magnetic Fields

Course Objectives:

1 To study the performance of transmission lines and travelling waves.
2 To understand the concept of voltage control, compensation methods and per unit representation of power systems.
3 To know the methods of overvoltage protection, Insulation coordination, Symmetrical components and fault calculation analysis

Course Outcomes: After learning the contents of this paper the student must 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.

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	1			1	1	1	1
CO2	3	2	2	3	2	1				1		1
CO3	3	3	3	3	1	1				1		1
CO4	3	3	3	3	2	1			1	1	1	1
CO5	3	3	3	3	2	1			1	1	1	1

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, Ferranti Effect.

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

UNIT-II:

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

phase modifiers, power factor improvement methods.

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

UNIT-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.

TEXT BOOK:

1 C.L. Wadhwa, “Electrical Power Systems”, New Age International Pub. Co, Third Edition, 2001

2 D.P. Kothari and I.J. Nagrath, “Modern Power System Analysis”, Tata Mc Graw Hill Pub. Co., New Delhi, Fourth edition, 2011

REFERENCE BOOKS:

1 A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, “A Text book on Power System Engineering”, Dhanpat Rai Publishing Company (P) Ltd, 2008

2 John J. Grainger & W.D. Stevenson, “Power System Analysis”, Mc Graw Hill International,1994.

3 Hadi Scadat, “Power System Analysis”, Tata Mc Graw Hill Pub. Co. 2002.

4 W.D. Stevenson, “Elements of Power system Analysis”, McGraw Hill International Student Edition.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- II SEM

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22EC410PC: DIGITAL ELECTRONICS LAB

Prerequisites: Analog Electronics & Digital Electronics

Course Objectives:

1 To learn basic techniques for the design of digital circuits and number conversion systems.
2 To implement simple logical operations using combinational logic circuits.
3 To design combinational logic circuits, sequential logic circuits.

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

1 Apply the concepts of logic families and logic gates.
2 Design of various code converters
3 Design and implement Combinational logic circuits.
4 Design and implement Sequential logic circuits
5 Design and realization logic gates for various logic families.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3	2	1											
CO2	3	2	2								1			
CO3	3	2	2		1				1	1	1	1		
CO4	3	2	2	2	1				1	1	1	1	1	1
CO5	3	2	2	2	1				1	1	1	1		

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 Asynchronous and Synchronous 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.,

TEXT BOOK:

1 A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2 M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCE BOOKS:

1 R.S. Sedha, “A Textbook of Digital Electronics”, S.Chand, 2005
2 R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009

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II YEAR B.TECH. EEE- II SEM

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22EE404PC: MEASUREMENTS AND INSTRUMENTATION LABORATORY

Prerequisites: Measurements and Instrumentation

Course Objectives:

1 To calibrate Watt, Energy and PF Meter and determination of three phase active & reactive powers.
2 To determine unknown inductance, resistance, capacitance by performing experiments on D.C Bridges & A. C Bridges.
3 To determine the ratio and phase angle errors of Instrument transformers.

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

1 Choose and test any measuring instruments.
2 Calibrate the PMMC instrument using D.C Potentiometer
3 Find the accuracy of any instrument by performing experiments.
4 Calculate the various parameters using different types of measuring instruments
5 Apply the transducer for various applications

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	1	3	1	2	1	1	2
CO2	3	2	3	3	3	2	3	1	2	1	2	
CO3	3	2	3	3	3	3	3	3	3	2	2	3
CO4	3	2	2	2	1	2	3	2	1	3	3	2
CO5	3	2	2	2	3	2	3	1	1	3	2	2

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 watt meter and two CTs.
3 C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given CT by Null method
4 PT testing by comparison – V. G. as Null detector – Measurement of % ratio error and

phase angle of the given PT

5 Resistance strain gauge – strain measurements and Calibration.

6 Transformer turns ratio measurement using AC bridges.

7 Measurement of % ratio error and phase angle of given CT by comparison

TEXT BOOK:

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

2 Dr. Rajendra Prasad, "Electrical Measurements & Measuring Instruments", Khanna Publishers 1989.

REFERENCE BOOKS:

1 G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016.

2 R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd.,2007.

3 S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012.

4 Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.

5 Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.

6 E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifth Edition,Wheeler Publishing, 2011.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

II YEAR B.TECH. EEE- II SEM

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22EE405PC: ELECTRICAL MACHINES LABORATORY – II

Prerequisites: Electrical Machines-I & Electrical Machines-II

Course Objectives:

1 To understand the operation of Induction, Synchronous machines and Transformers.
2 To study the performance analysis of Induction and Synchronous Machines through various testing methods.
3 To analyze the performance of single and 3-phase phase transformer with experiments.

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

1 Assess the performance of different types of AC machines using different testing methods
2 AnalyzethesuitabilityofACmachinesandTransformersforrealwordapplications.
3 Design the machine models based on the application requirements.
4 Determine equivalent circuit parameters of 3ph Induction motor
5 Demonstrate Scott connection on two single phase transformers

Cos	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	3	2	1	1	1	3	2
CO2	3	3	3	1	3	2	2	2	1	1	1	3
CO3	3	3	3	2	1	3	2	2	1	2	1	3
CO4	3	3	3	2	1	3	2	2	1	2	1	3
CO5	3	3	3	2	1	3	2	2	1	2	1	3

The following experiments are required to be conducted as compulsory experiments

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

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 Heat run test on a bank of 3 Nos. of single-phase Delta connected transformers
5 Measurement of sequence impedance of a three-phase alternator
6 Vector grouping of Three Transformer
7 Scott Connection of transformer

TEXT BOOK:

1 P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
2 I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

REFERENCE BOOKS:

1 Prithwiraj Purkait, Indrayudh Bandyopadhyay, “Electrical Machines”, Oxford, 2017.
2 M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
3 A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
4 A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004.

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II YEAR B.TECH. EEE- II SEM	**L**	**T**	**P**	**C**
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22MC410: CONSTITUTION OF INDIA

Course Objectives: Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
4. Discuss the passage of the Hindu Code Bill of 1956.

UNIT - 1 History of Making of the Indian Constitution- History of Drafting Committee

UNIT - 2 Philosophy of the Indian Constitution- Preamble Salient Features

UNIT - 3 Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

UNIT -4 Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT -5 Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root

democracy

UNIT -6 Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

SUGGESTED READING:

1 The Constitution of India, 1950 (Bare Act), Government Publication.
2 Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3 M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4 D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- I SEM **L T P C**

3 1 0 4

22EE501PC : POWER ELECTRONICS

Pre-requisites: Analog Electronics, Digital Electronics

Course Objectives:

1 To understand the various power semiconductor devices operations.
2 To know the AC-DC, AC-AC power conversions
3 To know the DC-DC, DC-AC power conversions.

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

CO1 Understand the differences between signal level and power level devices
CO2 Analyze controlled rectifier circuits.
CO3 Analyze the operation of DC-DC choppers and voltage source inverters.
CO4 Analyze the operation of AC Voltage controllers
CO5 Analyze the operation of Cyclo Converters

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO2	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO3	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO4	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO5	2	2	3	3	2	2	1	1	1	1	1	1	3	3

UNIT - I:

Power Switching Devices: Concept of power electronics, scope and applications, types of power converters; Power semiconductor switches and their V-I characteristics - Power Diodes, Power BJT, SCR, Power MOSFET, Power IGBT; Thyristor ratings and protection, methods of SCR commutation, UJT as a trigger source, gate drive circuits for BJT and MOSFETs

UNIT - II:

AC-DC Converters (Phase Controlled Rectifiers): Principles of single-phase fully-controlled converter with R, RL, and RLE load, Principles of single-phase half-controlled converter with RL and RLE load, Principles of three-phase fully-controlled converter operation with RLE load, Effect of load and source inductances, Generalide a of gating circuits, Single phase and Three phase dual converters

UNIT-III:

DC-DC Converters (Chopper/SMPS): Introduction, elementary chopper with an active switch and diode, concepts of duty ratio, average inductor voltage, average capacitor current. Buck converter - Power circuit, analysis and waveforms at steady state, duty ratio control of output voltage. Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage. Buck-Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

UNIT-IV:

AC-DC Converters (Inverters): Introduction, principle of operation, performance parameters, single phase bridge inverters with R, RL loads, 3-phase bridge inverters - 120- and 180-degrees mode of operation, Voltage control of single-phase inverters –single pulse width modulation,

multiple pulse width modulation, sinusoidal pulse width modulation.

UNIT-V:

AC-AC Converters: Phase Controller (AC Voltage Regulator)-Introduction, principle of operation of single-phase voltage controllers for R, R-L loads and its applications. Cyclo-converter-Principle of operation of single phase cyclo-converters, relevant waveforms, circulating current mode of operation, Advantages and disadvantages.

TEXT BOOKS:

1 M. H. Rashid, "Power electronics: circuits, devices, and applications", Pearson Education India, 2009.

2 N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.

REFERENCE BOOKS:

1 R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2007.

2 L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- I SEM

L	T	P	C
3	1	0	4

22EE502PC : CONTROL SYSTEMS

Pre-requisites: Matrix Algebra and Calculus, Applied and Multivariable Calculus, Numerical Methods and Complex Variables, Fundamental physical laws

Course objectives:

1 Understand the mathematical modeling of physical systems.
2 Comprehend the representation of dynamical systems through input-output models, including transfer functions and state-space models.
3 Understand the design of controllers and compensators to enhance the performance and stability of dynamical systems

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

CO1 Discuss the fundamentals of classical and modern control systems.
CO2 Understand system representations like transfer function and state space, and assess system
CO3 Evaluate system performance using both time and frequency domain analyses, identifying methods to enhance performance
CO4 Design controllers and compensators to improve system performance based on the assessments from time and frequency domain analyses.
CO5 Analyze the linear discrete time system in State space

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2	1	1	1	1	1		1	1
CO2	3	3	3	2	2	2	1			1	2	1	1	1
CO3	3	2	2	2	1	1	1	1	1		1	1		
CO4	2	2	2	3	3	2	1			1	1	1	1	1
CO5	3	3	2	3	1	1	1	1		1	1	1		1

UNIT - I:

Modeling of Physical Systems and Their Representations: Industrial and domestic Control examples. Mathematical modeling of physical systems: Mechanical and Electrical Systems, Concept of Control Systems Configurations: Open – loop and Closed loop Systems, Introduction to types of Systems: Linear, Non-Linear, Time Varying and Time Invariant. Representation of Linear time-invariant Systems through Input-output Models: Transfer function, Block-diagram Techniques, Signal flow graph. Concept of Feedback Control, Benefits of Feedback and Effects of feedback. Controller Components: DC Servo motors, AC Servomotors, Synchros.

UNIT - II:

TIME – Domain Analysis With Input-Output Models: Time response of first and second order systems for standard test inputs. Analysis of standard Second order systems with step input, Types of System, Error Analysis for Linear time Invariant Systems, Design specifications for second-order systems based on the time-response.

Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique.

Construction of Root-loci.

UNIT-III:

Frequency Domain Analysis: Introduction to frequency response, Relationship between time and frequency response, Polar plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Concept of Bode plots and construction. Closed-loop frequency response.

UNIT-IV:

Introduction To Design Of Classical Controllers And Compensators: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

UNIT-V:

State Variable Analysis And Design: Concept of State, State variables and State model. State – State Representation, Transformation of State variables, Solution of state equations and Complete response of the Systems. Stability Analysis of Linear Systems. Concept of controllability and observability. Design of State feedback Controllers through Pole-placement

TEXT BOOKS:

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
3	0	0	3

22EE503PC : MICROPROCESSORS & MICROCONTROLLERS

Pre-requisites: Programming, Digital Electronics

Course objectives:

1 To develop an understanding of the operations of microprocessors and micro controllers
2 To understand machine language programming and interfacing techniques
3 To gain knowledge about input output and memory systems.

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

1 Solve programs using 8086 instruction set
2 Analyze and program 8086 microprocessor for its applications
3 Discuss the Serial Communication and Bus Interface devices.
4 Analyze and program 8051 microcontrollers for its applications
5 Analyze various interfacing devices with 8051 microcontroller.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2			2	1					1	1	1
CO2	3	2	2			2	2					2	2	2
CO3	3	3	3			2	1					2	2	1
CO4	3	2	2			2	2					2	2	2
CO5	3	2	2			2	1					1	2	1

UNIT - I:

8086 Architecture-Pin diagram, Register Organization, Memory Segmentation, Programming Model, Modes of operation, Timing diagrams, Memory addresses, Physical Memory Organization, interrupts of 8086.

Instruction Set And Assembly Language Programming Of 8086: Instruction formats, addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations, Software Debugging tools, MDS.

UNIT - II:

I/O Interface: 8255 PPI, Various modes of operations and interface of I/O devices to 8086, A/D, D/A Converter Interfacing.

Interfacing With Advanced Devices: 8086 System bus structure, Memory and I/O Interfacing with 8086, Interfacing through various IC Peripheral Chips, 8257 (DMA Controller), 8259 (Interrupt Priority Control).

UNIT-III:

Communication Interface: Serial Communication Standards, USART Interfacing RS-232, IEEE-488, 20mA Current Loop, Prototyping and Troubleshooting,

UNIT-IV:

Introduction To Micro Controllers: Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming of 8051

Interrupts Communication: Interrupts - Timer/Counter and Serial Communication, Interrupt Priority in the 8051, Programming of 8051- Timers, Counters and Interrupts.

UNIT-V:

Interfacing And Industrial Applications: Applications of Micro Controllers, Interfacing 8051 to LED's, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing, Stepper Motor Interfacing

TEXT BOOKS:

1 Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.
2 The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.

REFERENCE BOOKS:

1 ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012
2 Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.
3 Introduction to Embedded Systems, Shibu K.V, MHE, 2009
4 The 8051 Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- I SEM

L	T	P	C
3	0	0	3

22EE511PE : IOT APPLICATIONS IN ELECTRICAL ENGINEERING
(Professional Elective-I)

Pre-requisites: Programming, Digital Electronics

Course objectives:

1 To learn about a few applications of Internet of Things and distinguish between motion less and motion detectors as IoT applications
2 To know about Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
3 To understand about applications of IoT in smart grid and new concept of IoE for various applications

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

CO1 To get exposed to recent trends in few applications of IoT in Electrical Engineering
CO2 To understand about usage of various types of motionless sensors and motion detectors
CO3 To know the basic concepts of MEMS based device designs
CO4 To get exposed to various applications of IoT in smart grid
CO5 To get exposed to future working environment with Energy internet

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	3	1	2	1	1	2	1	1	2	2
CO2	3	2	2	1	3	1	2	1	1	2	1	1	2	2
CO3	3	2	2	1	3	1	2	1	1	2	1	1	2	2
CO4	3	2	2	1	3	1	2	1	1	2	1	1	2	2
CO5	3	2	2	1	3	1	2	1	1	2	1	1	2	2

UNIT - I:

Sensors: Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric.

UNIT - II:

Occupancy and Motion detectors: Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors -Resistive microphones, Piezoelectric, Photo resistors

UNIT-III:

MEMS: Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and

fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors.

UNIT-IV:

IoT for Smart grid: Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home.

UNIT-V:

Internet of Energy: Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid.

TEXT BOOKS:

1 Jon S. Wilson, "Sensor Technology Hand book", Newnes Publisher, 2004
2 Tai Ran Hsu, "MEMS and Microsystems: Design and manufacture", 1st Edition, McGraw hill Education, 2017
3 Ersan Kabalci and Yasin Kabalci, "From Smart grid to Internet of Energy", 1st Edition, Academic Press, 2019.

REFERENCE BOOKS:

1 Raj Kumar Buyya and Amir Vahid Dastjerdi, "Internet of Things: Principles and Paradigms", Kindle Edition, Morgan Kaufmann Publisher, 2016
2 Yen Kheng Tan and Mark Wong, "Energy Harvesting Systems for IoT Applications": Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3 RMD Sundaram Shriram, K. Vasudevan and Abhishek S. Nagarajan, "Internet of Things", Wiley, 2019.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- I SEM

L	T	P	C
3	0	0	3

22EE512PE : HIGH VOLTAGE ENGINEERING

(Professional Elective-I)

Pre-requisites: Power Systems – I, Electro Magnetic Fields

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

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

1 Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials, generation and measurement of D. C., A.C., & Impulse voltages
2 Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.
3 Knowledge of how over-voltages arise in a power system, and protection against these over- voltages.
4 Ability to test power apparatus and insulation coordination.
5 Knowledge on High voltage laboratory layout, indoor and outdoor laboratories

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	2	1	2	1	1	1	1	2	1	1
CO2	3	2	3	2	2	-	2	1	2	1	2	2	2	2
CO3	2	1	2	1	2	2	1	1	1	2	1	2	2	2
CO4	3	2	3	2	2	2	2	1	1	1	1	2	1	2
CO5	3	1	3	1	3	2	2	1	1	1	1	2	2	1

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: Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III:

Measurements Of High Voltages And Currents: Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs 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 overvoltage's, Protection against over-voltages, Surge diverters, 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.

TEXT BOOKS:

1 M. S. Naidu and V. Kamaraju, "High Voltage Engineering", McGraw Hill Education, 2013
2 C. L. Wadhwa, "High Voltage Engineering", New Age International Publishers, 2007.

REFERENCE BOOKS:

1 D. V. Razevig (Translated by Dr. M. P. Chourasia), "High Voltage Engineering Fundamentals", Khanna Publishers, 1993.
2 E. Kuffel, W. S. Zaengl and J. Kuffel, "High Voltage Engineering Fundamentals", Newnes Publication, 2000.
3 R. Arora and W. Mosch "High Voltage and Electrical Insulation Engineering", John Wiley & Sons, 2011.
4 Various IS standards for HV Laboratory Techniques and Testing

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- I SEM

L	T	P	C
3	0	0	3

22EE513PE : COMPUTER AIDED ELECTRICAL MACHINE DESIGN
(Professional Elective-I)

Pre-requisites: Electrical Machines-I, Electrical Machines-II

Course Objectives:

1 To know the major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings,
2 To analyze the thermal considerations, heat flow, temperature rise, rating of machines.
3 To understand the design of machines and CAD design concepts

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

1 Understand the construction and performance characteristics of electrical machines.
2 Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
3 Understand the principles of electrical machine design and carry out a basic design of an ac machine using software tools.
4 Design the core, winding and cooling system for transformer
5 Understand the CAD for FEM based design, BLDC and SRM machines

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1				1			1		
CO2	2	1	2	1	1				1			1		
CO3	1	2	1	2	1				1			1		1
CO4	2	2	3	2	1							2		2
CO5	1	3	2	1	2							1		1

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 **c**omplex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

TEXT BOOKS:

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

REFERENCE BOOKS:

1 S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.
2 K. L. Narang, "A Text Book of Electrical Engineering Drawings", Satya Prakashan, 1969.
3 A. 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 Ansoft'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

22HS501MS : BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

Pre-requisites:

Course Objective: To learn the basic business types, impact of the economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course out comes:

1 The students will understand the various Forms of Business.
2 The Demand, Supply aspects have been learnt by the students.
3 Production, Cost, Market Structure, Pricing aspects could learn the students
4 The Students can learn to analyze the Financial Statements of a Company.
5 Select the appropriate method to calculate analysis of different ratios

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						1	3		2		3			
CO2						1	3		2	1	3			
CO3						1	3		2	1	3			
CO4						1	3				3			
CO5						2	3	2			3			

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 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, 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 (Simple Problems).

UNIT-V: Financial Ratios Analysis:

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1 Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
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

22EE504PC : MICROPROCESSORS & MICROCONTROLLERS LAB

Pre-requisites: Digital Electronics, Microprocessors and Microcontrollers

Course Objectives:

1 To develop an understanding of the operations of microprocessors and micro controllers;
2 To develop assembly language programming to perform various applications.
3 To understand the interfacing of various external devices to the processor and controllers.

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

1 Develop assembly language programming using 8086 instructions.
2 Develop assembly language programming using 8051 instructions
3 Analyze the delay using timers of 8051.
4 Evaluate the concept of serial communication using 8051.
5 Analyze I /O interfacing techniques on 8051 microcontroller based systems

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			2	1					1	3	2
CO2	3	3	2			2	2					2	3	2
CO3	3	3	1		2							2	2	1
CO4	3	3	2	2	2							2	3	3
CO5	3	2	1									1	2	2

The following programs/experiments are to be written for assembler and to be executed the same with 8086 and 8051 kits.

List of Experiments:

1 Programs for 16-bit arithmetic operations 8086(using various addressing modes)
2 Programs for sorting an array for 8086.
3 Programs for searching for a number of characters in a string for 8086.
4 Programs for string manipulation for 8086.
5 Programs for digital clock design using 8086.
6 Interfacing ADC and DAC to 8086.
7 Parallel communication between two microprocessor kits using 8255.
8 Serial communication between two microprocessor kits using 8251.
9 Interfacing to 8086 and programming to control stepper motor
10 Programming using arithmetic, logical and bit manipulation instructions of 8051.
11 Program and verify Timer/Counter in 8051.
12 Program and verify interrupt handling in 8051

13 UART operation in 8051.
14 Communication between 8051 kit and PC
15 Interfacing LCD to 8051
16 Interfacing Matrix/Keyboard to 8051
17 Data transfer from peripheral to memory through DMA controller 8237/8257

TEXT BOOKS:

1 Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.
2 The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.

REFERENCE BOOKS:

1 ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012
2 Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.
3 Introduction to Embedded Systems, Shibu K.V, MHE, 2009
4 The 8051 Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- I SEM

L	T	P	C
0	0	2	1

22EE505PC : POWER ELECTRONICS LAB

Pre-requisites: Power Electronics

Course Objectives:

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

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

CO1 Understand the operating principles of various power electronic converters
CO2 Use power electronic simulation packages& hardware to develop the power converters.
CO3 Analyze and choose the appropriate converters for various applications
CO4 Analyze the output waveforms of converters with different loads.
CO5 Understand the difference between the operation of AC -DC and DC-AC converters

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO2	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO3	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO4	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO5	2	2	3	3	2	2	1	1	1	1	1	1	3	3

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 loads

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 loads
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-loads
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

TEXT 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

REFERENCE BOOKS:

1 Reference guides of related software's
2 Rashid, Spice for power electronics and electric power, CRC Press

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- I SEM

L	T	P	C
0	0	2	1

22EE506PC : CONTROL SYSTEMS LAB

Pre-requisites: Control Systems

Course Objectives:

1 Understand system representations like transfer function and state space, and assess system dynamic response
2 Evaluate system performance using both time and frequency domain analyses, identifying methods to enhance performance.
3 Design controllers and compensators to improve system performance based on the assessments from time and frequency domain analyses

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

1 Design and Analyze AC and DC position control systems
2 Applying of knowledge to find the effect of P,PI,PD and PID controllers on closed loop system.
3 Design lead and lag compensators and obtain the frequency response characteristics.
4 Understand the basic concept of state space model using MATLAB
5 Design and observe the characterize of systems using MATLAB

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	2	1	2	1	1	1	1	2	1	1
CO2	3	2	3	2	2	-	2	1	2	1	2	2	2	2
CO3	2	1	2	1	2	2	1	1	1	2	1	2	2	2
CO4	3	2	3	2	2	2	2	1	1	1	1	2	1	2
CO5	3	1	3	1	3	2	2	1	1	1	1	2	2	1

The following experiments are required to be conducted compulsory experiments:

1 Time response of Second order system
2 Characteristics of Synchros
3 Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions, and application of speed control of motor.
Effect of feedback on DC servo motor
4 Transfer function of DC motor
5 Transfer function of DC motor
6 Transfer function of DC generator
7 Characteristics of AC servo motor
8 Lag and lead compensation – Magnitude and phase plot

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

1 Temperature controller using PID
2 Effect of P, PD, PI, PID Controller on a second order systems

(a) Simulation of P, PI, PID Controller.
(b) Linear system analysis (Time domain analysis, Error analysis) using suitable software

3 Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using suitable software

4 State space model for classical transfer function using suitable software -Verification

5 Design of Lead-Lag compensator for the given system and with specification using suitable software

TEXT BOOKS:

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
3	0	0	0

22MC510: INTELLECTUAL PROPERTY RIGHTS

Course Objectives:

1 Significance of intellectual property and its protection
2 Introduce various forms of intellectual property

Course out comes:

1 Distinguish and Explain various forms of IPRs
2 Identify criteria to fit one's own intellectual work in particular form of IPRs.
3 Apply statutory provisions to protect particular form of IPRs
4 Understand the methodology of implementing the process of trade secrets
5 Appraise new developments in IPR laws at national and international level

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1				1			1		
CO2	1	1	1	1	2				1			1		
CO3	1	2	1	1	1				1			1		1
CO4	1	1	2	1	1									1
CO5	2	2	1	1	1									

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 copyrights: Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT-IV:

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT-V:

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

TEXT BOOKS:

1 Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

REFERENCE BOOKS:

1 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- II SEM

L	T	P	C
3	0	0	3

22EE611OE: RENEWABLE ENERGY SOURCES
(Open Elective-I)

Pre-requisites: None

Course Objectives:

1 To recognize the awareness of energy conservation in students
2 To identify the use of renewable energy sources for electrical power generation
3 To collect different energy storage methods and detect about environmental effects of energy conversion

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

CO1 Understand the principles of wind power and solar photovoltaic power generation, fuel cells.
CO2 Assess the cost of generation for conventional and renewable energy plants
CO3 Design suitable power controller for wind and solar applications and analyze the issues involved in the integration of renewable energy sources to the grid
CO4 Identify methods of energy storage for specific applications.
CO5 Upon completion of this course, the students can able to identify the mechanical storage technologies for effective utilization of renewable energy sources

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	2	1	2	1	1	1	2	1	2	1
CO2	3	2	2	2	1	1	2	1	1	1	1	1	1	1
CO3	2	1	1	1	2	1	2	1	1	1	2	1	2	1
CO4	2	2	2	1	2	1	2	1	1	1	1	1	2	2
CO5	1	1	1	1	1	1	2	1	1	1	1	1	1	1

UNIT - I:

Introduction

Renewable Sources of Energy-Grid-Supplied Electricity-Distributed Generation-Renewable Energy Economics-Calculation of Electricity Generation Costs –Demand side Management Options – Supply side Management Options-Modern Electronic Controls of Power Systems.

Wind Power Plants:

Appropriate Location -Evaluation of Wind Intensity -Topography -Purpose of the Energy Generated - General Classification of Wind Turbines-Rotor Turbines- Multiple-Blade Turbines Drag Turbines -Lifting Turbines-Generators and Speed Control used in Wind Power Energy Analysis of Small Generating Systems.

UNIT - II:

Photovoltaic Power Plants

Solar Energy-Generation of Electricity by Photovoltaic Effect -Dependence of a PV Cell Characteristic on Temperature-Solar cell Output Characteristics-Equivalent Models and Parameters

for Photovoltaic Panels-Photovoltaic Systems-Applications of Photovoltaic Solar Energy-Economical Analysis of Solar Energy.

Fuel Cells: The Fuel Cell-Low and High Temperature Fuel Cells-Commercial and Manufacturing Issues Constructional Features of Proton Exchange-Membrane Fuel Cells –Reformers-Electrolyzer Systems and Related Precautions-Advantages and Disadvantages of Fuel Cells-Fuel Cell Equivalent Circuit- Practical Determination of the Equivalent Model Parameters -Aspects of Hydrogen as Fuel.

UNIT-III:

Induction Generators

Principles of Operation-Representation of Steady-State Operation-Power and Losses Generated-Self- Excited Induction Generator-Magnetizing Curves and Self-Excitation Mathematical Description of the Self-Excitation Process-Interconnected and Stand-alone operation -Speed and Voltage Control - Economical Aspects

UNIT-IV:

Storage Systems

Energy Storage Parameters-Lead–Acid Batteries-Ultra Capacitors-Flywheels –Superconducting Magnetic Storage System-Pumped Hydroelectric Energy Storage - Compressed Air Energy Storage - Storage Heat -Energy Storage as an Economic Resource

UNIT-V:

Integration of Alternative Sources of Energy

Principles of Power Injection-Instantaneous Active and Reactive Power Control Approach Integration of Multiple Renewable Energy Sources-Islanding and Interconnection Control-DG Control and Power Injection.

Interconnection Of Alternative Energy Sources with the Grid:

Interconnection Technologies -Standards and Codes for Interconnection-Interconnection Considerations -Interconnection Examples for Alternative Energy Sources.

TEXT BOOKS:

1 Felix A. Farret, M. Godoy Simoes, “Integration of Alternative Sources of Energy”, John Wiley& Sons, 2006.
2 Solanki: Renewable Energy Technologies: Practical Guide For Beginneers, PHI Learning Pvt. Ltd., 2008.

REFERENCE BOOKS:

1 D. Mukherjee: Fundamentals of Renewable Energy Systems, New Age International publishers, 2007.
2 Remus Teodorescu, Marco Liserre, Pedro Rodríguez: Grid Converters for Photovoltaic and Wind Power Systems, John Wiley & Sons, 2011
3 Gilbert M. Masters: Renewable and Efficient Electric Power Systems, John Wiley & Sons, 2004.

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III YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE612OE: :FUNDAMENTAL OF ELECTRIC VEHICLES (Open Elective-I)

Pre-requisites: None; Interest in electric Vehicles

Course Objectives:

1 To understand the fundamentals of Electric Vehicles (EVs), especially in Indian Context.
2 To examine technology associated with each element of EV drive-train
3 To get into the economics of EVs in India vis-à-vis petrol vehicles.

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

1 Understand the fundamentals of Electric Vehicles.
2 identify the various forces and loads and performance under acceleration and Concept of Drive Cycle
3 Design of batteries, EV motors Fundamentals of EV Battery Pack design
4 Design of Power electronic controllers for EV systems.
5 Analyze the economics of EV market and EV data using Analytical tools

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1					1			1		
CO2	2	3	1	1					1			1		
CO3	2	3	2	1					1			1		2
CO4	2	3	1	1								1		1
CO5	2	2	2	1								1		1

UNIT - I:

Introduction

Overview of Electric Vehicles in India, India's EV program, Charging and Swapping Infrastructure, brief introduction of batteries, Lithium for batteries, EV Subsystems.

UNIT - II:

Vehicle Dynamics: Forces acting when a vehicle move, Aerodynamic drag, Rolling Resistance and Uphill Resistance, Power and Torque to accelerate. **Drive Cycle:** Concept of Drive Cycle, Drive Cycles and Energy used per km.

UNIT-III:

EV Powertrain: Design of EV Drive Train, Introduction to Battery Parameters, Why Lithium Ion Battery? Batteries in Future, Li-Ion Battery Cells, SoH and SoC estimation and Self Discharge, Battery Pack Development, Computation of Effective cost of battery, Charging Batteries.

Fundamentals of EV Battery Pack design: Mechanical, Thermal and Electrical Design, BMS Design of Electric Vehicle.

UNIT-IV:

EV Motors and Controllers: Fundamentals and Design, Understanding Flow of Electricity, Magnetism and Heat, Power and Efficiency, Torque Production, Speed and Back EMF, the d-q Equivalent circuit, Field-oriented Control, Understanding Three phase AC and DC to AC conversion systems, Understanding the thermal design of the motors, Engineering Considerations, Future Frontiers.

UNIT-V:

EV Charging: Introduction, Slow or Fast EV Chargers, Battery Swapping, Standardization and On board Chargers, Public Chargers, Bulk Chargers/Swap Stations, Economics of Public Chargers in context, Analytics and Tools for EV systems.

TEXT BOOKS:

1 Electric Powertrain - Energy Systems, Power electronics and drives for Hybrid, electric and fuel cell vehicles by John G. Hayes and A. Goodarzi, Wiley Publication
2 Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004
3 Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

REFERENCE BOOKS:

1 James Larminie, John Lowry, *Electric Vehicle Technology Explained*, Wiley, 2003
2 Chris Mi, M. Abul Masrur, David Wenzhong Gao, *Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives*, John Wiley & Sons Ltd., 2011
3 Fundamentals of Electric Vehicles: technology and economics
https://onlinecourses.nptel.ac.in/noc20_ee99/preview
https://archive.nptel.ac.in/courses/108/106/108106170/
4 Link to EV101 course –
https://www.pupilfirst.school/courses/641/curriculum
Link to EV201 course:
https://www.pupilfirst.school/courses/643/curriculum

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE621PE: CYBER-PHYSICAL SYSTEMS
(Professional Elective-II)

Pre-requisites: None; Interest in cyber-physical systems

Course Objectives:

1 To gain insight into the seamless integration of computational algorithms and physical processes within cyber-physical systems
2 To develop proficiency in analyzing and managing the dynamic interactions between the cyber and physical components in diverse applications.
3 To explore practical applications, focusing on the design, implementation, and optimization of cyber-physical systems for real-world

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

CO1 Achieve a thorough understanding of the core principles that form the foundation of Cyber-Physical Systems
CO2 Apply the knowledge to successfully identify safety specifications and critical properties crucial for ensuring the safety of CPS.
CO3 Develop proficiency in utilizing abstraction techniques for system designs, and effectively express pre- and post-conditions as well as invariants for CPS models.
CO4 Analyze the performance of embedded processing, memory, bus efficiencies, real time operating system performance h/w s/w code sign.
CO5 To develop the student's ability to understand the concepts of cyber physical system software with special emphasis on real time operating system and particularly real time job scheduling

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	2	2	1	2	2	1	1	1	2	2
CO2	2	2	2	1	1	2	2	2	2	1	2	2	1	1
CO3	1	2	3	2	3	2	2	2	2	2	1	1	1	1
CO4	1	2	1	1	1	2	2	2	1	2	1	1	1	1
CO5	2	2	2	2	2	2	2	2	2	1	1	1	1	1

UNIT - I:

Introduction to Cyber-Physical Systems (CPS): Cyber-Physical Systems in the real world, Basic principles of design and validation of CPS, Industry 4.0 and its implications, Auto SAR and IIOT (Industrial Internet of Things), Applications in Building Automation and Medical CPS

UNIT - II:

CPS Platform Components: CPS Hardware platforms: Processors, Sensors, Actuators, CPS Network: Wireless Hart, CAN, Automotive Ethernet, CPS Software stack: Real-Time Operating Systems (RTOS), Scheduling, Overview of CPS Software components and their mapping to

Electronic Control Units (ECUs).

UNIT-III:

Principles of Automated Control Design: Dynamical Systems and Stability, Controller Design Techniques, Stability Analysis using Common Lyapunov Functions (CLFs) and Multiple Lyapunov Functions (MLFs), Performance analysis under Packet drop and Noise

UNIT-IV:

CPS Implementation and Performance Analysis: Translating features into software components, Mapping software components to ECUs, Performance Analysis of CPS, considering scheduling, bus latency, and faults, Network congestion and its impact on control performance

UNIT-V:

Formal Methods, Software Analysis, and Secure Deployment: Advanced Automata-based modeling and analysis, Timed and Hybrid Automata for CPS, Formal Analysis techniques: Flow pipe construction, reachability analysis, Analysis of CPS Software: Weakest Pre-conditions, Bounded Model Checking, Frama-C, CBMC, Secure Deployment of CPS: Attack models, Secure Task mapping, and Partitioning, State estimation for attack detection. **Case Studies in CPS Automotive Case Study:** Vehicle ABS hacking, **Power Distribution Case Study:** Attacks on Smart Grids

TEXT BOOKS:

1 Raj Rajkumar, Dionisio De Niz, and Mark Klein, *Cyber-Physical Systems*, ddison-Wesley Professional
2 Rajeev Alur, *Principles of Cyber-Physical Systems*, MIT Press, 2015.

REFERENCE BOOKS:

1 André Platzer, *Logical Analysis of Hybrid Systems: Proving Theorems for Complex Dynamics.*, Springer, 2010. 426 pages, ISBN 978-3-642-14508-7.
2 Jean J. Labrosse, *Embedded Systems Building Blocks: Complete and Ready-To-Use Modules in C*, The publisher, Paul Temme, 2011.
3 Introduction to Embedded Systems - A Cyber-Physical Systems Approach, by E. A. Lee and S. A. Seshia, 2014. The book is available in two forms: a free PDF download and low-cost paperback.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE622PE: POWER ELECTRONIC APPLICATIONS TO RENEWABLE ENERGY SYSTEMS
(Professional Elective-II)

Pre-requisites: Power Electronics, Renewable Energy Sources

Course Objectives:

1 To impart knowledge on different types of renewable energy systems.
2 To analyze the operation of electrical generators used for the wind energy conversion Systems.
3 To know the operation of power converters and PV systems operation

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

1 Proficiently demonstrate various renewable energy technologies utilized for electrical power generation.
2 Analyze the operating principles of different types of wind generators and identify suitable converters (AC-DC, DC-DC, AC-AC) for renewable energy systems.
3 Understand the characteristics of various types of wind turbines , its components and various power converter topologies
4 Understand the modelling of different types of wind generators
5 Analyse the various types of hybrid energy systems with its architecture.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	2	1				1			1		
CO2	1	2	1	1	2				2			1		
CO3	2	1	1	2	1				1			2		1
CO4	2	1	2	1	1									1
CO5	2	2	1	1	2									

UNIT - I:

Solar cell characteristics and their measurement, PV Module, PV array, Partial shading of a solar cell and a module, the diode, Power conditioning unit, maximum power point tracker, Implementation of Perturb and Observe Method, Incremental Conductance Method, Battery charger/discharge controller

UNIT - II:

Centralized Inverters, String Inverters, Multi-string Inverters, Module Integrated Inverter/Micro-inverters, Inverter Topology, Model of Inverter, Sizing Batteries and Inverters for a Solar PV System.

Types of PV Systems: Grid-Connected Solar PV System, Stand-Alone Solar PV System.

UNIT-III:

Introduction to wind: Characteristics, Wind Turbine, Fixed and Variable-Speed Wind Turbines,

Components of WECS, Description of Components, Types of Wind Turbine Generators, Economics of Wind Energy Conversion Systems, Linking Wind Turbines onto the Grid, Power Converter Topologies for Wind Turbine Generators.

UNIT-IV:

Modeling of Permanent Magnet Synchronous Generators, Doubly Fed Induction Generators, Squirrel cage Induction Generators wind turbine, Control of Power converters for WECS.

UNIT-V:

Hybrid Energy Systems, Need for Hybrid Energy Systems, Range and types of Hybrid systems, Hybrid Solar PV/Wind Energy System, Architecture of Solar-Wind Hybrid System and Grid connected issues

TEXT BOOKS:

1 S. N. Bhadra, D. Kastha, S. Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
2 S. N. Bhadra, D. Kastha, & S. Banerjee "Wind Electrical Systems", Oxford University Press, 2009

REFERENCE BOOKS:

1 Rai. G. D, "Non- conventional energy sources", Khanna Publishers, 1993.
2 Rai. G.D," Solar energy utilization", Khanna Publishes, 1993
3 Gray, L. Johnson, "Wind energy system", Prentice Hall of India, 1995
4 B.H.Khan "Non-conventional Energy sources", Mc Graw-hill, 2nd Edition, 2009

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE623PE: WIND AND SOLAR ENERGY SYSTEMS
(Professional Elective-II)

Pre-requisites: Energy Systems

Course Objectives:

1 To study the physics of wind power and energy, understanding the principles governing wind generator operation
2 To gain knowledge about solar power resources, analyze solar photovoltaic cells, and discuss solar thermal power generation.
3 To identify and understand network integration issues associated with renewable energy sources like wind and solar power.

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

1 Understand the energy scenario and the consequent growths of the wind power.
2 Understand the different Wind Generator Topologies
3 Understand the basic physics of sun and solar power generation
4 Understand the power electronic interfaces for wind and solar generation and grid-integration issues.
5 Understand the CAD for FEM based design, BLDC and SRM machines

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1		1		1	1	1		1		1		
CO2	2	1	1	1	1	1	1	1	1	1		1		1
CO3	2	1		1	1	1	1	1	1	1		1		1
CO4	2	1	2	1	1	1	1	1	1	1	1	1	2	2
CO5	2	1	2	1	1	1	1	1	1	1	1	1	2	2

UNIT - I:

Physics Of Wind Power: History of wind power, Indian and Global statistics, Wind physics, Betz limit ratio, stall and pitch control, Wind speed statistics-probability distributions, and Wind power-cumulative distribution functions.

UNIT - II:

Wind Generator Topologies: Review of modern wind turbine technologies, Fixed and Variable speed wind turbine, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent Magnet Synchronous Generators, Power electronics converters. Generator configurations, Converter Control

UNIT-III:

The Solar Resource: Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

Solar Photovoltaic: Technologies-Amorphous, mono-crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems,

Maximum Power point Tracking (MPPT) algorithms. Converter Control.

UNIT-IV:

Network Integration Issues: Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems

UNIT-V:

Solar Thermal Power Generation: Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

TEXT BOOKS:

1 T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005
2 G. M. Masters, "Renewable and Efficient Electric Power Systems**",** John Wiley and Sons, 2004.

REFERENCE BOOKS:

1 S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.
2 H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006.
3 G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004.
3 J. A. Duffie and W. A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Sons, 1991.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE601PC: DIGITAL SIGNAL PROCESSING

Pre-requisites: Laplace Transforms, Numerical Methods and Complex variables, Control Systems

Course Objectives:

1 Provide foundational knowledge for the analysis and processing of digital signals
2 Explore the relationships between continuous-time and discrete-time signals and systems, emphasizing time, frequency, and Z-plane analysis.
3 Introduce real-world signal processing applications while studying the design and structures of digital filters, including IIR and FIR, and addressing finite word length effects.

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

CO1 Appeal the concepts of linear difference equations and forming of Realization structures.
CO2 Employ DFT and FFT concepts to obtain frequency domain characteristics of DTS.
CO3 Analyze digital IIR filters by suitable design procedures.
CO4 Evaluate digital FIR filters by suitable design procedures.
CO5 Multi-rate digital signal processing on DTS and discusses finite word length effects.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2			2	1					1	2	2
CO2	3	2	2									2		2
CO3	3	3	3	1										3
CO4	3	3	3											2
CO5	3	3	2	2								1	2	3

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 **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

UNIT - II:

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, and FFT with General Radix-N.

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, and Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, and Comparison of IIR & FIR filters.

UNIT-V:

Multi-Rate Digital Signal Processing: Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion, Conversion of Band Pass Signals, Concept of Resampling, Applications of Multi Rate Signal Processing.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round off Noise, Methods to Prevent Overflow, Tradeoff between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXT BOOKS:

1 Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
2 Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009

REFERENCE BOOKS:

1 Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009
2 Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
3 Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
4 Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachorand Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE602PC: POWER SYSTEM PROTECTION

Pre-requisites: Power Systems-I, Power Systems-II

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 out comes: At the end of the course the student will be able to:

CO1 Compare and contrast electromagnetic, static, and microprocessor-based relays
CO2 Apply technology to protect power system components.
CO3 Analyze quenching mechanisms used in air, oil, and vacuum circuit breakers
CO4 Analyze the difference between over current and distance protection.
CO5 Understand the types and applications of Fuses.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO2	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO3	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO4	2	2	3	3	2	2	1	1	1	1	1	1	3	3
CO5	2	2	3	3	2	2	1	1	1	1	1	1	3	3

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,

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 DC breakers, ratings of circuit breakers, testing of circuit breakers.
Fuses: Introduction, fuse characteristics, types of fuses, application of HRC fuses, discrimination.

TEXT BOOKS:

1 Badriram 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 Electromechanical to Microprocessors", New Age International

TEEGALA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE603PC: POWER SYSTEM OPERATION AND CONTROL

Pre-requisites: Power System-I, Power System-II

Course Objectives:

1. Understand the principles and significance of real power control, emphasizing the importance of frequency control in power systems.
2. Analyze various methods for effective reactive power control in power systems.
3. Grasp the concepts of unit commitment, economic load dispatch, and real-time control, highlighting their importance in power system operation.

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

CO1 Able to applying the load flow equations to analyze the various load flow methods
CO2 Evaluate the load sharing between two plants.
CO3 Analyze the load frequency control problem and design the model of isolated power system
CO4 Able to analyze whether the machine is stable or unstable position
CO5 Analyze the various functions of EMS and SCADA.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	1	1	1		1	3	3
CO2	3	3	3	3	2	1	1	1	1	1	1	1	3	3
CO3	3	3	3	3	1	1	1	1	1	1	1	1	3	3
CO4	3	3	3	3	2	1	1	1	1	1		1	3	2
CO5	3	3	3	3	2	1	1	1	1	1	1	1	3	2

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:

PF 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.

TEXT BOOKS:

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 Education Private Limited 2011.

REFERENCE BOOKS:

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

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- II SEM

L	T	P	C
0	0	2	1

22EE604PC: POWER SYSTEM LAB

Pre-requisites: Power System-I, Power System-II, Power System Protection, Power System Operation and Control, Electrical Machines

Course Objectives:

1 To perform testing of CT, PT's and Insulator strings
2 To find sequence impedances of 3-Φ synchronous machine and Transformer
3 To perform fault analysis on Transmission line models and Generators

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

CO1 Able to analyze the various types of protective relays
CO2 Evaluate the A, B, C, D constants of a transmission line
CO3 Compute the sequence impedances of three phase transformer and synchronous machine
CO4 Able to Formulate the Admittance and impedance matrices
CO5 Analyze the various load flow methods

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2								1			2	2
CO2	3	3	3	3	2	1	1	1		1		1	3	3
CO3	3	3	3	2	1	1	1		1	1		1	3	3
CO4	3	3	3	3	3	1	1			1		1	3	3
CO5	3	3	3	3	3	1	1		1	1	1	1	3	3

The following experiments are required to be conducted as compulsory experiments:

Part - A

1 Characteristics of IDMT Over-Current Relay
2 Differential protection of 1-Φ transformer.
3 Characteristics of Micro Processor based Over Voltage/Under Voltage relay.
4 A, B, C, D constants of a Long Transmission line
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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- II SEM **L T P C**

0 0 2 1

22EN601HS: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

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

1 Develop Listening and Reading skills, with a focus on vocabulary
2 Build written communication skills to meet the needs of their academic and career endeavours.
3 Choose appropriate language in their oral communications in various social and professional contexts.
4 Demonstrate the nuances of language and body language through group activities
5 Take part in interviews with confidence thereby enhancing their employability skills

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					2				2	3		2		
CO2					2	2			2	3		2		
CO3					2	2			3	3		2		
CO4						2			3	3		2		
CO5									3	3		2		

1. INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates
- Participating in group discussions.
- Facing interviews
- Writing project/research reports/technical reports
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication

2. OBJECTIVES:

- This Lab focuses on using multi-media instruction for language development to meet the following targets:
- 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.
- Further, they would be required to communicate their ideas relevantly and coherently in

writing.

- To prepare all the students for their placements

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **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.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **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.

4. MINIMUM REQUIREMENT:

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

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used**.**

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1 Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2 Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1 Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007

2 Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3 Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4 Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5 English Vocabulary in Use series, Cambridge University Press 2008.
6 Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning
7 Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8 Job Hunting by Colm Downes, Cambridge University Press 2008.
9 English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- II SEM

L	T	P	C
0	0	2	1

22EE605PC: DIGITAL SIGNAL PROCESSING LAB

Pre-requisites: Digital Signal Processing

Course Objectives:

1 To implement Linear and Circular Convolution
2 To implement FIR and IIR filter and architecture of DSP processor
3 To demonstrate Finite word length effect

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

1 Apply DFT and frequency response for given discrete time signal.
2 Analyze FFT and its computation complexity in comparison to DFT for given input sequence.
3 Analyze the concept of IIR digital filters.
4 Evaluate the concept of FIR digital filters.
5 Evaluate response of multi-rate signal processing for suitable desired specifications.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			2	2	2					2	2	2
CO2	3	3			2							2	2	2
CO3	3	3			2	2	2					2	3	2
CO4	3	3			2							2	3	2
CO5	3	3	3		2	2	2					2	2	2

List of Experiments (programs):

1 Generation of Sin usoidal Waveform / Signal based on Recursive Difference Equations
2 To find DFT / IDFT of given DT Signal
3 To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
4 Implementation of FFT of given Sequence
5 Determination of Power Spectrum of a given Signal(s).
6 Implementation of LP FIR Filter for a given Sequence/Signal.
7 Implementation of HP FIR Filter for a given Sequence/Signal
8 Implementation of LP IIR Filter for a given Sequence/Signal
9 Implementation of HP IIR Filter for a given Sequence/Signal
10 Generation of Sinusoidal Signal through Filtering
11 Generation of DTMF Signals
12 Implementation of Decimation Process
13 Implementation of Interpolation Process
14 Implementation of I/D Sampling Rate Converters
15 Audio application such as to plot a Time and Frequency display of Microphone plus a Cosine using DSP. Read a .wav file and match with their respective spectrograms.
16 Noise Removal: Add noise above 3 KHz and then remove, interference suppression using 400 Hz tone.

17 Impulse Response of First order and Second Order Systems.

(The above Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors)

Note: - Minimum of 12 experiments has to be conducted.

LIST OF MAJOR EQUIPMENTS & SOFTWARE

- MATLAB with Simulink
- TMS 320C50 DSP Processors (Kit & Add-on Cards)
- Signal Processing Tool Box
- Function Generators (1MHz)
- Cathode Ray Oscilloscope (30MHz)

TEXT BOOKS:

1 Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007
2 Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009

REFERENCE BOOKS:

1 Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009
2 Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
3 Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
4 Digital Signal Processing - A Practical approach, Emmanuel C. If each orand Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

ONLINE RESOURCES:

1 NPTEL DSP Course: Lectures, notes, and lab assignments for DSP (NPTEL DSP Course)
2 DSP Course on edX: Video lectures, lab assignments, and quizzes (DSP Course on edX)
3 https://sjce.ac.in/wp-content/uploads/2021/11/dsp-lab-manual-2021-22.pdf

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

III YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	0

22MC610: ENVIRONMENTAL SCIENCE

Course out comes:

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 out comes: Based on this course, the students will learn,

1 Know basic concept of ecological perspective and the value of the environment.
2 Understand 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, Discover effective methods of waste management and come out with best possible solutions.
5 Raise awareness about environmental laws and sustainable development.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	2			3	3	2			1	1		
CO2						1	3	2				1		
CO3		2	3			2	2	2				1		
CO4		1	1			3	3	2			1	2		
CO5						2	2	3				2		

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, Biomagnification, 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:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate 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

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, 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.

TEXT BOOKS:

1 Textbook 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, 4th Edition, New age international publishers.
5 Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- I SEM

L	T	P	C
3	1	0	4

22EE701PC: 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 converter topologies
3 To appreciate the motoring and braking operations of drive and differentiate DC and AC drives

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

1 Identify the drawbacks of speed control of motor by conventional methods.
2 Differentiate Phase controlled and chopper-controlled DC drives speed-torque characteristics merits and demerits
3 Understand Ac motor drive speed–torque characteristics using different control strategies utilization its merits and demerits
4 describe Slip power recovery schemes
5 Illustrate the different types of control mechanism in Synchronous motors

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	1	1	1	1	1	1	1	3	2
CO2	3	1	2	1	1	1	1	1			1	2	3	2
CO3	3	2	1	2	2	1	1	1	1	1	1	1	3	2
CO4	3	1	2	2	1	1	1	1	1		1	2	3	2
CO5	3	2	2	2	1	1	1	1	1	1	1	2	3	3

UNIT - I

Control of DC Motors

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

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

UNIT - II

Four Quadrant 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 chopper 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)

UNIT - III

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.

TEXT BOOKS:

1 "G K Dubey", Fundamentals of Electric Drives, CRC Press, 2002.
2 "Vedam Subramanyam", Thyristor Control of Electric drives, Tata McGraw Hill Publications, 1987.

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

IV YEAR B.TECH. EEE- I SEM

L	T	P	C
3	0	0	3

22EE721OE: UTILIZATION OF ELECTRIC ENERGY
(Open Elective-II)

Pre-requisites: Electrical Machines-I and Electrical Machines-II

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 out comes: At the end of the course the student will be able to:

CO1 Understand basic principles of electric heating and welding
CO2 Determine the lighting requirements for flood lighting, household and industrial needs
CO3 Calculate heat developed in induction furnace and evaluate speed time curves for traction
CO4 Sketch the Speed Time Curves for Traction Services
CO5 Develop the Systems of Train Lighting Methods

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	3	1	1	2	2	3	2	2
CO2	3	2	3	2	1	1	2	1	1	2	2	3	3	2
CO3	3	3	2	2	2	1	3	1	1	2	2	3	3	2
CO4	2	3	3	2	2	1	2	1	1	1	1	2	3	2
CO5	3	3	3	3	1	1	2	1	1	1	1	2	2	2

UNIT - I

Electrical Heating: Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.

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 and metal 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, attractive 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.

TEXT BOOKS:

1 H. Partab: Modern Electric Traction, Dhanpat Rai & Co, 2007.
2 E. Openshaw Taylor: Utilisation of Electric Energy, Orient Longman, 2010.

REFERENCE BOOKS:

1 H. Partab: Art & Science of Utilization of Electric Energy, Dhanpat Rai & Sons, 1998
2 N.V. Suryanarayana: Utilization 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

22EE722OE: RELIABILITY ENGINEERING
(Open Elective – II)

Prerequisite: Mathematics-III (Laplace Transforms, Numerical Methods and Complex variables)

Course Objectives:

1 To introduce the basic concepts of reliability, various models of reliability
2 To analyze reliability of various systems
3 To introduce techniques of frequency and duration for reliability evaluation of repairable systems

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

1 model various systems applying reliability networks and evaluation of the same
2 estimate the limiting state probabilities of repairable systems
3 apply various mathematical models for evaluating reliability of irreparable systems
4 Evaluate time dependent probability using Discrete Markov Chains
5 Understand the frequency and duration techniques

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	2	1	1	1	1	1	1	1	2	2
CO2	3	1	1	1	1	1					1	1	2	2
CO3	3	1	1	1	1	1					1	1	2	2
CO4	3	1	1	1	1	1					1	1	2	2
CO5	3	1	1	1	1	1					1	1	2	2

UNIT - I

Basic Probability Theory: Elements of probability, probability distributions, Random variables, Density and Distribution functions- Mathematical expected – variance and standard deviation – **BINOMIAL DISTRIBUTION:** Concepts, properties, engineering applications

UNIT - II

Network Modeling And Evaluation Of Simple Systems: Basic concepts- Evaluation of network Reliability / Unreliability - Series systems, Parallel systems - Series-Parallel systems- Partially redundant systems- Examples.

Network Modeling And Evaluation Of Complex Systems: Conditional probability method- tie set, Cut-set approach- Event tree and reduced event tree methods- Relationships between tie and cut-sets- Examples.

UNIT - III

Probability Distributions In Reliability Evaluation: Distribution concepts Terminology of distributions, General reliability functions, Evaluation of the reliability functions, shape of reliability functions –Poisson distribution – normal distribution, exponential distribution, Weibull distribution.

Network Reliability Evaluation Using Probability Distributions: Reliability Evaluation of Series systems, Parallel systems – Partially redundant systems- determination of reliability measure- MTTF for series and parallel systems – Examples.

UNIT - IV

Discrete Markov Chains: Basic concepts- Stochastic transitional probability matrix- time dependent probability evaluation- Limiting State Probability evaluation- Absorbing states – Application.

Continuous Markov Processes: Modeling concepts- State space diagrams- Unreliability evaluation of single and two component repairable systems

UNIT - V

Frequency And Duration Techniques: Frequency and duration concepts, application to multi state problems, Frequency balance approach.

Approximate System Reliability Evaluation: Series systems – Parallel systems- Network reduction techniques- Cut set approach- Common mode failures modeling and evaluation techniques- Examples.

TEXT BOOKS:

1 Roy Billinton and Ronald N Allan, Reliability Evaluation of Engineering Systems, Plenum Press
2 E. Balagurusamy, Reliability Engineering by Tata McGraw-Hill Publishing Company Limited

REFERENCE BOOKS:

1 Reliability Engineering: Theory and Practice by Alessandro Birolini, Springer Publications.
2 An Introduction to Reliability and Maintainability Engineering by Charles Ebeling, TMH Publications.
3 Reliability Engineering by Elsayed A. Elsayed, Prentice Hall Publications

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- I SEM

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22EE731PE: MOBILE APPLICATION DEVELOPMENT
(Professional Elective-III)

Prerequisites
1. Acquaintance with JAVA programming
2. A Course on DBMS

Course Objectives
1. To demonstrate their understanding of the fundamentals of Android operating systems
2. To improves their skills of using Android software development tools
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform
4. To demonstrate their ability to deploy software to mobile devices
5. To demonstrate their ability to debug programs running on mobile devices

Course out comes:
1. Understand the working of Android OS Practically
2. Develop Android user interfaces
3. Develop, deploy and maintain the Android Applications
4. Program mobile applications for the Android operating system that use basic and advanced phone features.
5. Deploy applications to the Android marketplace for distribution

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	1	2	2	2	3	1	1
CO2	2	1	2	3	2	2	2	2	1	2	2	3	1	1
CO3	2	3	2	2	3	3	3	2	2	2	2	3	1	2
CO4	2	2	1	1	2	2	2	1	1	1	1	2	1	1
CO5	3	3	3	3	3	2	2	1	1	1	1	2	1	1

UNIT - I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring unit - s Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components –Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT - III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS
Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity
Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT - IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT - V

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXT BOOKS:

1 Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.

REFERENCE BOOKS:

1 Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.
2 Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IVYEAR B.TECH. EEE- I SEM

L	T	P	C
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22EE732PE: SIGNALS AND SYSTEMS
(Professional Elective-III)

Prerequisite: Digital Signal Processing, Control Systems, Laplace Transforms, Numerical Methods and Complex variables

Course Objectives:

1 To develop ability to analyze linear systems and signals
2 To develop critical understanding of mathematical methods to analyze linear systems and signals
3 To know the various transform techniques and sampling principles

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

1 Understand the concept of signals and systems
2 Analyze system characteristics for given specifications
3 Analyze the concepts of Fourier Transform techniques for given specifications
4 Estimate ROC and stability conditions of S and Z domains for given Conditions
5 Design system using the concept of sampling theorem

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3			3	2					1	3	2
CO2	3	3	2			1	3					3	2	2
CO3	3	3	3			3	2					2	3	3
CO4	3	3	3			1	3					3		3
CO5	3	3	2			1	2					2	3	2

UNIT - I

Introduction To Signals And Systems: Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute inerrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, reliability. Examples

UNIT - II

Behaviour of Continuous and Discrete-Time LTI Systems: Impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response

UNIT - III

Fourier Transforms: Fourier series representation of periodic signals, Waveform Symmetries,

Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

UNIT - IV

Laplace and Z- Transforms: Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis

UNIT - V

Sampling And Reconstruction

The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

TEXT BOOKS:

1 A. V. Oppenheim, A. S. Willsky and S. H. Nawab, “Signals and systems”, Prentice Hall India, 1997.
2 J. G. Proakis and D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms, and Applications”, Pearson, 2006.

REFERENCE BOOKS:

1 H. P. Hsu, “Signals and systems”, Schaum’s series, McGraw Hill Education, 2010.
2 S. Haykin and B. V. Veen, “Signals and Systems”, John Wiley and Sons, 2007.
3 A. V. Oppenheim and R. W. Schafer, “Discrete-Time Signal Processing”, Prentice Hall, 2009.
4 M. J. Robert “Fundamentals of Signals and Systems”, McGraw Hill Education, 2007.
5 B. P. Lathi, “Linear Systems and Signals”, Oxford University Press, 2009

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- I SEM

L	T	P	C
3	0	0	3

22EE733PE: ELECTRIC AND HYBRID VEHICLES
(Professional Elective-III)

Prerequisite: Power Semiconductor Drives, Electrical Drives and Control, Utilization of Electric Energy

Course Objectives:

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.
3 To have a knowledge on types of electric machines that can be used energy storage devices, etc.

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

1 Understand the models to describe hybrid vehicles and their performance
2 Classify various types of hybrid vehicle configurations to interpret their compatibility in specific applications.
3 Identify specific configuration of electric vehicle, electric drive machine and power converter as per the requirement to Analyze the performance of system design.
4 Understand the different possible ways of energy storage
5 Understand the different strategies related to energy storage systems.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1									1		
CO2	2	3	1									1		
CO3	2	3	2		2							1		2
CO4	2	3	1		2							1		1
CO5	2	2	2		1							1		1

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).

TEXT BOOKS:

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.

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

IVYEAR B.TECH. EEE- I SEM

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22EE741PE: HVDC TRANSMISSION
(Professional Elective-IV)

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 and understand Graetz circuit with 6 and 12 pulse operation
2 To control HVDC systems with various methods and to perform power flow analysis in AC/DC systems
3 To describe various protection methods for HVDC systems and Harmonics

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

1 Compare EHV ACand 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 analysis in AC/DC systems
4 Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters
5 Determine pay back periods for energy saving equipment

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	1	1		1	1	2	1	1	1	1
CO2	3	3	3	2	2	2	1			1	2	1	1	1
CO3	3	2	2	2	1	1	1	1	1		1	1		
CO4	1	2	1	3	3	2	1			1	1	1	1	1
CO5	1	1	1	1	1	1	1	1		1	1	1		

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 trends in D.C. Transmission.

Analysis of HVDC 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 DC link, 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, Radio interference

UNIT - V

Harmonics: Generation of Harmonics, Characteristics harmonics, calculation of AC Harmonics, Non- Characteristics harmonics, adverse 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.

TEXT BOOKS:

1 "K. R. Padiyar", HVDC Power Transmission Systems: Technology and system Interactions, New Age International (P) Limited, and Publishers, 1990.
2 "S K Kamakshaiah, V Kamaraju", HVDC Transmission, TMH Publishers, 2011

REFERENCE BOOKS:

1 "S. Rao", EHVAC and HVDC Transmission Engineering and Practice, Khanna publications, 3rd Edition 1999.
2 "Jos Arrillaga", HVDC Transmission, The institution of electrical engineers, IEE power & energy series 29, 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, 2009

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- I SEM

L	T	P	C
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22EE742PE: POWER SYSTEM RELIABILITY
(Professional Elective-IV)

Prerequisite: Reliability Engineering, Power System-I, Power System-II, Power System Operation and Control

Course Objectives:

1 To describe the generation system model and recursive relation for capacitive model building
2 To explain the equivalent transitional rates, cumulative probability and cumulative frequency
3 To develop the understanding of risk, system and load point reliability indices

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

CO1 Describe merging generation and load models
CO2 Estimate loss of load and energy indices for the generation systems model
CO3 Apply various indices for the distribution system and evaluate the reliability of interconnected systems
CO4 Concept of Operating Reserve Evaluation
CO5 Probability Approach on Bulk Power System Reliability Evaluation

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	1	1	1	1	1	1	3	3
CO2	3	2	2	2	2	2	1	1	1	1	1	1	3	3
CO3	3	2	2	2	2	2	1	1	1	1	1	1	3	3
CO4	3	2	2	2	2	2	1	1	1	1	1	1	3	3
CO5	3	2	2	2	2	2	1	1	1	1	1	1	3	3

UNIT - I

Basic Probability Theory: Elements of probability, probability distributions, Random variables, Density and Distribution functions- Binomial distribution- Expected value and standard deviation - Binomial distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution.

Definition of Reliability: Definition of terms used in reliability, Component reliability, Hazard rate, derivation of the reliability function in terms of the hazard rate. Hazard models - Bath tub curve, Effect of preventive maintenance. Measures of reliability: Mean Time to Failure and Mean Time between Failures.

UNIT - II

Generating System Reliability Analysis

Generation system model – capacity outage probability tables – Recursive relation for capacitive model building – sequential addition method – unit removal – Evaluation of loss of load and energy indices – Examples. Frequency and Duration methods – Evaluation of equivalent transitional rates

of identical and non-identical units – Evaluation of cumulative probability and cumulative frequency of non-identical generating units – 2-level daily load representation - merging generation and load models – Examples.

UNIT - III

Operating Reserve Evaluation

Basic concepts - risk indices – PJM methods – security function approach – rapid start and hot reserve units – Modeling using STPM approach.

Bulk Power System Reliability Evaluation:

Basic configuration – conditional probability approach – system and load point reliability indices – weather effects on transmission lines – Weighted average rate and Markov model – Common mode failures.

Interconnected System Reliability Analysis

Probability array method – Two inter connected systems with independent loads – effects of limited and unlimited tie capacity - imperfect tie – Two connected Systems with correlated loads – Expression for cumulative probability and cumulative frequency.

UNIT - IV

Distribution System Reliability Analysis

Basic Techniques – Radial networks –Evaluation of Basic reliability indices, performance indices – load point and system reliability indices – customer oriented, loss and energy-oriented indices – Examples. Basic concepts of parallel distribution system reliability

UNIT - V

Substations and Switching Stations

Effects of short-circuits - breaker operation – Open and Short-circuit failures – Active and Passive failures – switching after faults – circuit breaker model – preventive maintenance – exponential maintenance times.

TEXT BOOKS:

1 Reliability Evaluation of Power systems by R. Billinton, R. N. Allan, BS Publications, 2007
2 Reliability Modeling in Electric Power Systems by J. Endrenyi, John Wiley and Sons, 1978

REFERENCE BOOKS:

1 Reliability Engineering: Theory and Practice by Alessandro Birolini, Springer Publications
2 An Introduction to Reliability and Maintainability Engineering by Charles Ebeling, TMH Publications.
3 Reliability Engineering by E. Balaguruswamy, TMH Publications
4 Reliability Engineering by Elsayed A. Elsayed, Prentice Hall Publications.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- I SEM

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22EE743PE: EMBEDDED SYSTEMS APPLICATIONS
(Professional Elective-IV)

Prerequisite: C Language, I/O, Analog and Digital interfacing, and peripherals.

Course Objectives:

1 To equip with the basic concepts of embedded system, applications in which they are used,
2 To describe tools and methodologies needed for embedded system design.
3 To know RTOS concepts and familiar with the characteristics of latency in real-time systems.

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

1 Understand the microprocessor architecture and its components used in embedded systems
2 Write the 8051-assembly language code and Embedded 'C' code for various
3 Develop simple embedded systems for real time operations
4 To introduce Basics of Real time operating system and example tutorials to discuss on one real time operating system tool
5 Develop programming skills in embedded systems for various applications

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	3	2	2	1	2	2	2	2	1	2
CO2	3	3	2	2	2	3	3	2	2	2	2	2	1	2
CO3	3	2	3	2	2	3	3	1	3	3	3	3	1	3
CO4	2	2	2	3	3	3	2	1	2	2	2	2	1	2
CO5	3	3	3	3	2	2	3	2	2	2	2	2	3	1

UNIT - I

Embedded Systems Basics:

Introduction to Embedded systems, Examples of embedded systems, Typical Hardware, Gates, Timing Diagrams, Memory, Microprocessors, Buses, Direct Memory Access, Interrupts, Microprocessor Architecture, and Interrupt Basics.

UNIT - II

The 8051 Architecture: Introduction, 8051 Micro controller Hardware, Input/output Pin Ports and Circuits, External Memory, Serial data Input/output, Interrupts.

UNIT - III

Embedded C Programming: Overview of the C standard library, Embedded System Oriented Topics, MISRA C — Designing Safer C Programs, Basics of event driven programming.

Basic Assembly Language Programming Concepts: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051.

UNIT - IV

Moving Data: Introduction, Addressing Modes, External Data Moves, Code Memory ReadOnly

Data Moves, Push and Pop Opcodes, Data Exchanges.

Basic Design Using a Real-Time Operating System: Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment

UNIT - V

Applications: Introduction, keyboards, Human Factor, Key Switch Factors, Keyboard Configurations, Displays, Seven-Segment Numeric Display, D/A and A/D Conversions.

Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System.

TEXT BOOKS:

1 An Embedded Software Primer, David E. Simon, Pearson Education
2 The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson.

REFERENCE BOOKS:

1 Embedded Microcomputer Systems Real Time Interfacing, Jonathan W.Valvano, Cengage Learning.
2 8051 Microcontrollers, Satish Shah, Oxford Higher Education.
3 Micro Controllers, Ajay V Deshmukhi, TMH
4 Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.
5 Microcontrollers, Raj kamal, Pearson Education. a. http://nptel.ac.in/courses.php b. http://jntuk- coeerd.in/

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- I SEM

L	T	P	C
2	0	0	2

22MC610: ENVIRONMENTAL SCIENCE

Course Objective: To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills for Engineers.

Course out comes: Based on this course, the students will learn,

1 Able to apply the concepts & principles of management in real life industry.
2 Students can able to learn the planning and decision making methods
3 Students can understand different organization development design methods
4 Evaluate the concepts of leadership and motivation.
5 The various Control techniques have learnt the students.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2		2	1			2	1	1
CO2		1	1	1		2		2	2	2		2	1	1
CO3						2		2	2	2		3	2	2
CO4						3		3	3	3		3	3	3
CO5						2		3	2	2		2	2	2

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 Framework 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, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods

TEXT BOOKS:

1 Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
2 Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCE BOOKS:

1 Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
2 Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
3 Industrial Engineering and Management: Including Production Management, T. R. Banga, S.C Sharma, Khanna Publishers.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- I SEM

L	T	P	C
4	0	4	2

22EE702PC: SIMULATION OF RENEWABLE ENERGY SYSTEMS LAB

Prerequisite: Renewable Energy Systems, Power Electronics

Course Objectives:

1 Develop proficiency in modeling the steady-state and dynamic characteristics of photovoltaic (PV), fuel cell, and wind energy sources.
2 Understand and analyze power converter topologies for stand-alone and grid-connected PV, fuel cell, and wind energy systems.
3 Explore advanced topics in power electronics, including maximum power point tracking, power factor correction, switched capacitor DC-DC converters, ZVS/ZCS configurations, compensation schemes, and new power converter topologies.

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

1 Demonstrate the ability to model and analyze the steady-state and dynamic characteristics of PV, fuel cell, and wind energy sources.
2 Apply knowledge to understand, design, and analyze power converter topologies for both stand-alone and grid-connected PV, fuel cell, and wind energy systems.
3 Acquire advanced expertise in power electronics, covering topics such as maximum power point tracking, power factor correction, switched capacitor converters, ZVS/ZCS configurations, compensation schemes, and new power converter topologies.
4 Understand the Compensation Schemes for VAR, harmonics and phase imbalance Power conversion and Electric Drives New power converter topologies and their analysis, modeling and simulation.
5 Analysis of measurement and mitigation of EMI in Electronic and power electronic systems High frequency link power conversion Radiation effects on power electronic systems and components EMI/EMC.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	2								1		2
CO2	2	3	1	2								1		
CO3	2	3	2	2	2							1		2
CO4	2	3	1	2	2							1		1
CO5	2	2	2	1	1							1		1

List of experiments:

1 Modelling the steady state and dynamic characteristics of the following

i. PV,
ii. Fuel cell and
iii. Wind energy sources

2 Power converter topologies for stand –alone and grid connected

i. PV,
ii. Fuel cell and
iii. Wind energy sources

3 Maximum Power Point Tracking Schemes
4 Power factor correction techniques for AC to DC systems
5 Switched capacitor DC – DC power converters
6 ZVS, ZCS configurations
7 Compensation Schemes for VAR, harmonics and phase imbalance Power conversion and Electric Drives
8 New power converter topologies and their analysis, modelling and simulation
9 High frequency link power conversion
10 Radiation effects on power electronic systems and components EMI/EMC
11 Analysis, measurement and mitigation of EMI in Electronic and power electronic systems
12 Microgrid Power Quality

***Note:** Perform the simulation of the above list of experiments with MATLAB/any Simulation software

TEXT BOOKS:

1 S. N. Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
2 S.N.Bhadra, D. Kastha, & S. Banerjee "Wind Electrical Systems", Oxford University Press, 2009.
3 Rashid.M. H, "Power Electronics Hand book", Academic Press, 2001.

REFERENCE BOOKS:

1 Rai. G.D, "Non-conventional energy sources", Khanna Publishers, 1993.
2 Rai. G.D," Solar energy utilization", Khanna Publishes, 1993
3 Gray, L. Johnson, "Wind energy system", Prentice Hall of India, 1995.
4 B.H.Khan "Non-conventional Energy sources", Mc Graw-hill, 2nd Edition, 2009

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE831OE: CHARGING INFRASTRUCTURE FOR ELECTRIC VEHICLES
(Open Elective - III)

Prerequisite: None, Interest in Electric Vehicles

Course Objectives:

1 Gain understanding of the various components involved in an electric vehicle charging system.
2 Comprehend the different types of electric vehicle chargers, along with the applicable standards governing their design and operation.
3 Interpret the diverse communication protocols utilized in electric vehicle charging systems and stay familiar with the latest trends in this evolving field.

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

CO1 Understand the various components of the Electric vehicle charging system
CO2 Comprehend the different types of Electric vehicle chargers and their standards
CO3 Interpret the various communication protocols and recent trends in Electric vehicle charging
CO4 Analyze the concept of public charging infrastructure
CO5 Understand the Future frontiers in EV charging

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	1	1	1	1	1	1	3	3
CO2	2	2	2	2	2	2	1	1	1	1	1	1	3	3
CO3	2	2	2	2	2	2	1	1	1	1	1	1	3	3
CO4	2	2	2	2	2	2	1	1	1	1	1	1	3	3
CO5	2	2	2	2	2	2	1	1	1	1	1	1	3	3

UNIT - I

Introduction to EV charging:

Electric Vehicle Charging; Charging Modes; Electric Vehicle Supply Equipment (EVSE): Types, Components of EV Battery Chargers; Challenges in Electric Vehicle Charging.

UNIT - II

Charger sizing and standards:

Charger Classification; Slow Charging and Fast Charging; DC Charging and AC Charging; Selection and Sizing of Chargers: Charger Connectors and Cables; Charging Standards: Connectors, Supply Equipment; EMI/EMC; Testing Methods for Chargers and EVSE

UNIT - III

EV charger communications protocols:

Open Charge Point Protocol (OCPP); Open System Interconnection Layer Model (OSI); Adapted PWM Signal based Low-level Communication; PLC based High-level Communication; CAN

Communication; Billing and Authentication

UNIT - IV

Public charging infrastructure:

Location, Planning and Implementation of Public Charging Stations; Components; Selection and Sizing

- HT/LT Equipment & Cables; Protection; Safety Standards: Policy and Regulatory Aspects; EV Charging Station and their Business Models; Economic Aspects; Major Challenges

UNIT - V

Future frontiers in EV charging:

Bulk Charging; Battery Swapping; Wireless Charging; EVs as Distributed Storage Resources: Grid to Vehicle (G2V) and Vehicle to Grid (V2G), V2X Concept, Integration of Charging Station with Renewable Sources and its Impact on the Grid

TEXT BOOKS:

1 Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals", 3rd Edition, CRC Press, 2021

2 Code of Practice for Electric Vehicle Charging Equipment Installation, 4th Edition, IET, 2020.

REFERENCE BOOKS:

1 Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid

2 Electric Vehicles", 1st Edition, Springer, 2013.

3 Tom Denton, "Automotive Electrical and Electronic Systems", 5th Edition, Routledge, 2018.

4 Wolfhard Lawrenz, "CAN System Engineering: From Theory to Practical Applications", Springer, 2nd Edition, 2013.

Weblink: https://www.udemy.com/course/charging-infrastructure-for-electric-vehicles/

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE832OE: ENERGY STORAGE SYSTEMS
(Open Elective-III)

Course Objectives: to prepare the students to

1 To introduce generalized storage techniques and analyze the different features of storage systems
2 To know the management and applications of energy storage technologies
3 To know about electrical energy storage market potential by different forecasting methods

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

CO1 Understand the role of electrical energy storage technologies in electricity usage
CO2 Know the behavior and features and applications of energy storage system
CO3 Understand the hierarchy, demand for energy storage and valuation techniques.
CO4 Analyze the Valuation Techniques of EES
CO5 Understand the different types of energy storage systems

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	2	2	1	1	1	1	1	1	3	3
CO2	2	2	1	1	2	2	1	1	1	1	1	1	3	3
CO3	2	2	1	1	2	2	1	1	1	1	1	1	3	3
CO4	2	2	1	1	2	2	1	1	1	1	1	1	3	3
CO5	2	2	1	1	2	2	1	1	1	1	1	1	3	3

UNIT - I

The Roles Of Electrical Energy Storage Technologies In Electricity Use: 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, 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 - II

Types And 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, Lead-Acid Batteries, Lithium-Ion Batteries, Flow batteries, Other Batteries in Development, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG), Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES),Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

UNIT - III

Applications Of EES: Present status of applications, Utility use (conventional power generation,

grid operation & service), Consumer use (uninterruptable power supply for large consumers), EES installed capacity worldwide, new trends in applications, Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles,

UNIT - IV

Management And Control Hierarchy Of EES: 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.

Demand For Energy Storage: Growth in Variable Energy Resources, Relationship between balancing services and variable energy resources, Energy Storage Alternatives, Variable Generator Control, Demand Management, Market Mechanisms, and Longer-Term Outlook.

Valuation Techniques: Overview, Energy Storage Operational Optimization, Market Price Method, Power System Dispatch Model Method, Ancillary Service Representation, Energy Storage Representation, Survey of Valuation Results.

UNIT - V

Forecast Of EES Market Potential By 2030: EES market potential for overall applications, EES market estimation by Sandia National Laboratory (SNL), EES market estimation by the Boston Consulting Group (BCG), EES market estimation for Li-ion batteries by the Panasonic Group, EES market potential estimation for broad introduction of renewable energies, EES market potential estimation for Germany by Fraunhofer, Storage of large amounts of energy in gas grids, EES market potential estimation for Europe by Siemens, EES market potential estimation by the IEA, Vehicle to grid concept, EES market potential in the future.

TEXT BOOKS:

1 Power System Energy Storage Technologies, 1st Edition by Paul Breeze, Academic Press
2 Energy Storage: Systems and Components, by Alfred Rufer, CRC Press, 2017

REFERENCE BOOKS:

1 Energy Storage Fundamentals, Materials and Applications, by Huggins and Robert, Springer
2 www.ecofys.com/com/publications

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE851PE: POWER QUALITY & FACTS
(Professional Elective-V)

Prerequisite: Power Electronics, Power System Operation and Control, HVDC Transmission

Course Objectives:

1 Define power quality and explore various terms associated with it. Study voltage-related power quality issues, focusing on short and long interruptions
2 Conduct a detailed study on characterizing voltage sags, with a specific emphasis on magnitude and three-phase unbalanced voltage sags. Understand how power quality issues affect the behavior of power electronics loads and rotating machinery
3 Gain an understanding of FACTS controllers, their controllable parameters, and types. Explore the importance of shunt and series compensation, focusing on the control and comparison of STATCOM and SVC, and the functioning and regulation of other FACTS devices like GCSC, TSSC, and TCSC

Course out comes: After completion of this course, the student will be able to

1 Understand the concept of voltage sag transformation from up-stream (higher voltages)
2 Choose proper controller for the specific application based on system requirements
3 Understand the control circuits of Shunt Controllers SVC
4 Understand the Power and control circuits of Series Controllers GCSC, TSSC and TCSC
5 Understand the Power and control circuits of UPFC

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1	1	1	1	1	1	1	3	2
CO2	3	3	2	1	1	2		1	1	1		1	3	2
CO3	2	2	3	2	2			1	1	1		1	3	2
CO4	2	1	1	1	2	1	1	1	1	1	1	1	3	2
CO5	2	2	2	2	2	1	1	1	1	1	1	1	3	2

UNIT - I

Power Quality Problems In Distribution Systems: Power Quality problems in distribution systems: Transient and Steady state variations in voltage and frequency. Unbalance, Sags, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations. Flicker and its measurement

UNIT - II

Transmission Lines And Series/Shunt Reactive Power Compensation: Basics of AC Transmission. Analysis of uncompensated AC transmission lines. Passive Reactive Power Compensation. Shunt and series compensation at the mid-point of an AC line. Comparison of Series and Shunt Compensation.

UNIT - III

Static Shunt Compensators: Objectives of shunt compensation, Methods of controllable VAR

generation, Static Var Compensator, its characteristics, TCR, TSC, FC-TCR configurations, STATCOM, basic operating principle, control approaches and characteristics

UNIT - IV

Static Series Compensators: Objectives of series compensator, variable impedance type of series compensators, TCSC, TSSC-operating principles and control schemes, SSSC, Power Angle characteristics, Control range and VAR rating, Capability to provide reactive power compensation, external control

UNIT - V

Combined Compensators: Introduction to Unified Power Flow Controller, Basic operating principles, Conventional control capabilities, independent control of real and reactive power.

TEXT BOOKS:

1 Electrical Power Systems Quality, Dugan Roger C, Santoso Surya, Mc Granaghan, Marks F. Beaty and H. Wayre, Mc Graw Hill
2 Power Systems Quality Assessment, J. Arillaga, N.R. Watson, S.Clon, John Wiley.

REFERENCE BOOKS:

1 Power Quality, C.Sankaran, CRC Press 4. Understanding power quality problems, Math H. Bollen, IEEE press
2 "Understanding FACTS –Concepts and Technology of Flexible AC Transmission Systems" Narain G. Honorani, Laszlo Gyugyi

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE852PE: SOLAR POWER BATTERIES
(Professional Elective-V)

Prerequisite: Renewable Energy Sources, Energy Storage Systems

Course Objectives:

1 To understand the PV systems and the solar power batteries operation
2 To analyze the solar PV system storage with batteries
3 To understand Grid Tie vs. Off-Grid Solar Battery System

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

1 Understand the different types of PV systems.
2 Know operating principles of different types of solar power batteries
3 Use the batteries for effective storage of solar PV.
4 Know the selection of suitable batteries based on the application
5 Gain the knowledge on environmental impacts of solar power batteries

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	1	1	1	1	1	1	1	1	1	1
CO2	2	1	2	1	1	1	1	1	1	1	-	1	-	2
CO3	2	1	1	-	1	1	1	1	-	1	-	1	1	2
CO4	2	1	1	1	2	1	-	1	1	1	1	1	1	1
CO5	2	-	1	-	1	1	2	1	-	1	-	1	-	1

UNIT - I

Introduction to solar PV systems, basics of Storage for solar PV systems, Storage for solar PV systems: the batteries, Introduction to Solar Power Batteries, terminology associated, understanding Solar Battery Specifications, working principle, Series Vs. Parallel, Charging parameters, cycle life, Temperature effects, Battery Design and Construction, Important components in battery construction.

UNIT - II

Primary and Secondary batteries, Classification of Secondary batteries, i.e Lead-Acid, Lead-Antimony, Lead-Calcium, Lead-Acid Battery Chemistry, Nickel-Cadmium Batteries and their types.

UNIT - III

AC Coupled Storage vs. DC Coupled Storage, working of Solar Batteries with a Solar Power System and Hybrid Inverter, Main Degradation mechanisms of Solar Batteries, Battery Strengths and Weaknesses, Battery System Design and Selection Criteria, Life Expectancy, Battery standards, Safety precautions

UNIT - IV

Solar Battery Costs, Declining Cost, factors contribute to the performance of solar battery, selection

of suitable batteries based on the application, Grid Tie vs. Off-Grid Solar Battery System, Benefits and disadvantages of using solar batteries,

UNIT - V

The environmental impacts of batteries: Introduction, Service life of the components, Energy requirements for production and transport of the PV-battery system components, Contributing components, Influence of different user conditions, Uncertainties, Future research, Energy return factor, The overall battery efficiency, Different efficiency measures and battery design, The Future of Solar Battery Storage.

TEXT BOOKS:

1 S. Sumathi and L. Ashok Kumar, Solar PV and Wind Energy Conversion Systems: An Introduction to Theory, Modeling with MATLAB/SIMULINK, and the Role of Soft Computing Techniques, Springer 2011
2 H.A. Kiehne, "Battery Technology Handbook" by *Publisher:* CRC Press 2003
3 https://core.ac.uk/download/pdf/30044842.pdf
4 Handbook on Battery Energy Storage System
5 https://www.adb.org/sites/default/files/publication/479891/handbook-battery-energy-storage-system.pdf

REFERENCE BOOKS:

1 Cristina Archer and S. Lovejoy, Battery Technology for Electric Vehicles: Public Science and Private Innovation, Springer 2015
2 Soteris A. Kalogirou, "Solar Energy Engineering: Processes and Systems" by, Academic Press, *Year: 2009*
3 https://files.bregroup.com/bre-co-uk-file-library copy/filelibrary/nsc/Documents%20Library/NSC%20Publications/88031-BRE_Solar-Consumer- Guide-A4-12pp.pdf
4 https://www.sunwize.com/tech-notes/solar-battery-basics/
5 https://palmetto.com/learning-center/blog/how-does-a-solar-battery-work
6 https://www.letsgosolar.com/faq/what-is-a-solar-battery/
7 https://www.purevolt.ie/domestic-solar/equipment/solar-storage-batteries.php

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE853PE: 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 and genetic Algorithms.
2 To observe the concepts of FFN and concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy control
3 To analyze genetic algorithm, genetic operations and genetic mutations.

Course out comes: At the end of this course, students 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 To know the fuzzy logic control techniques
4 To understand the Genetic Algorithm techniques
5 Apply the AI techniques to electrical applications

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2			1			1			1	2	2
CO2	3	2	2	2	3	1			1		1	1	2	2
CO3	3	2	2	2	2	1			1		1	1	2	2
CO4	3	2	2	2	2	1			1		1	1	2	2
CO5	3	3	3	3	2	1			2		1	2	2	2

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-Boltzmann learning, supervised learning-Unsupervised learning–Reinforcement Learning-Learning tasks

UNIT - II

ANN Paradigms: Multi-layer perceptron using Back propagation Algorithm (BPA), Self – Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network

UNIT - III

Fuzzy Logic: Introduction –Fuzzy versus crisp, Fuzzy Sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets –Fuzzy Cartesian Product, Operations on Fuzzy relations – Fuzzy logic–Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.

UNIT - IV

Genetic Algorithms: Introduction-Encoding –Fitness Function-Reproduction operators, Genetic Modeling –Genetic Operators-Cross over-Single site cross over, two 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.

TEXT BOOKS:

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

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE861PE: SMART GRID TECHNOLOGIES
(Professional Elective-VI)

Pre-requisites: None

Course Objectives:

1 To defend smart grid design to meet the needs of a utility
2 To select issues and challenges that remain to be solved
3 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 out comes: At the end of this course, students will be able to:

1 Understand the different types of PV systems.
2 Know operating principles of different types of solar power batteries
3 Use the batteries for effective storage of solar PV.
4 Know the selection of suitable batteries based on the application
5 Gain the knowledge on environmental impacts of solar power batteries

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	3	1	1	2	2	3	2	1
CO2	2	2	3	2	3	1	2	1	1	2	2	2	3	1
CO3	3	3	2	3	2	1	3	1	1	2	2	3	2	1
CO4	2	3	3	2	2	1	2	1	1	1	1	2	3	1
CO5	2	3	3	3	3	1	2	1	1	1	1	2	2	1

UNIT - I

Introduction To Smart Grid: What is Smart Grid? Working definitions of Smart Grid and Associated Concepts –Smart grid Functions-Traditional Power Grid and Smart Grid –New Technologies for Smart Grid – Advantages –Indian Smart Grid –Key Challenges for Smart Grid.

UNIT - II

Smart Grid Architecture: Components and Architecture of Smart Grid Design –Review of the proposed architectures for Smart Grid. The fundamental components of Smart Grid designs – Transmission Automation – Distribution Automation –Renewable Integration

UNIT - III

Tools And Techniques For Smart Grid: Computational Techniques –Static and Dynamic Optimization Techniques –Computational Intelligence Techniques –Evolutionary Algorithms – Artificial Intelligence techniques

UNIT - IV

Distribution Generation Technologies: Introduction to Renewable Energy Technologies –Micro grids –Storage Technologies –Electric Vehicles and plug –in hybrids –Environmental impact and

Climate Change –Economic Issues.

Communication Technologies And Smart Grid: Introduction to Communication Technology – Synchro-Phasor Measurement Units (PMUs) –Wide Area Measurement Systems (WAMS).

UNIT - V

Control Of Smart Power Grid System

Load Frequency Control (LFC) in Micro Grid System –Voltage Control in Micro Grid System – Reactive Power Control in Smart Grid. Case Studies and Test beds for the Smart Grids.

TEXT BOOKS:

1 Stuart Borlase, Smart Grids, Infrastructure, Technology and Solutions, CRC Press, 2013
2 Gil Masters, Renewable and Efficient Electric Power System, Wiley-IEEE Press, 2004

REFERENCE BOOKS:

1 A.G. Phadke and J.S. Thorp, "Synchronized Phasor Measurements and their Applications", Springer Edition, 2010
2 T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2005.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

IV YEAR B.TECH. EEE- II SEM

L	T	P	C
3	0	0	3

22EE862PE: ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective-VI)

Pre-requisites: Power System – I, Power System - II

Course Objectives:

1 To understand design considerations of feeders
2 To compute voltage, drop and power loss in feeders
3 To understand protection, PF improvement and voltage control

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

1 Distinguish between transmission and distribution line and design the feeders
2 Analyze the Electrical distribution systems for Voltage drop & Power loss calculations in lines.
3 Analyze and Design the operation of Protective devices used to distribution systems & Coordination.
4 Apply the different methods to improve the power factor
5 Analyze the importance of voltage control and its methods

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	1	1	1	1	1	1	1	1	3	2
CO2	3	2	2	2		2	1	1	1	1	1	1	3	3
CO3	3	2	2	2	1	1	1	1	1	1		1	3	3
CO4	1	2	1		2	2	1	1	1	1	1	1	3	3
CO5	1	1	1	1	1	1	1	1	1	1		1	3	3

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

TEXT BOOKS:

1 Turan Gonen, Electric Power Distribution System Engineering, CRC Press, 3rd Edition 2014.
2 V. Kamaraju, Electrical Power Distribution Systems, Tata Mc Graw Hill Publishing Company, 2nd 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

22EE863PE: MACHINE LEARNING APPLICATIONS TO ELECTRICAL ENGINEERING
(Professional Elective-VI)

Pre-requisites: Mathematics, Python

Course Objectives:

1 To develop a foundational understanding of machine learning principles and techniques
2 To explore and understand how machine learning can be integrated into various electrical engineering applications
3 To gain hands-on experience in implementing machine learning algorithms to solve real-world electrical engineering problems

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

1 Understand the different types of learning methods
2 Understand the Fundamentals of Electrical Engineering Relevant to ML.
3 Demonstrate proficiency in applying machine learning algorithms to solve 66 real-world problems in electrical engineering.
4 Integrate machine learning principles effectively into electrical engineering applications
5 Enhance problem-solving skills by successfully addressing complex issues in electrical engineering through machine learning

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	1	1		1		1		1		
CO2	3	2	1	1	1	1		1		1		1		
CO3	3	3	2	1	2	1		1	1	1	1	1	2	2
CO4	3	3	2	1	3	1		1	1	1	1	1	2	2
CO5	3	3	2	1	3	1	1	1	1	1	1	1	2	2

UNIT - I

Introduction to Machine Learning:

Definition and types of machine learning, Historical perspective, Basic concepts: supervised learning, unsupervised learning, reinforcement learning

UNIT - II

Fundamentals of Electrical Engineering Relevant to ML:

Overview of electrical circuits and systems, Signal processing basics, Introduction to control systems

UNIT - III

Data Preprocessing and Feature Engineering:

Data cleaning and handling missing values, Feature scaling and normalization, Feature extraction and selection

UNIT - IV

Machine Learning Algorithms for Electrical Engineering Applications

Regression and classification algorithms, Decision trees and ensemble methods, Neural networks and deep learning, Support vector machines, Clustering algorithms for pattern recognition

UNIT - V

Case Studies and Applications in Electrical Engineering

Power system optimization using ML, Fault detection and diagnostics in electrical systems, Smart grid applications, Signal processing with ML, Control system optimization and adaptive control using ML

TEXT BOOKS:

1 C. Aldrin Renold and Sumathi S., Pattern Recognition and Machine Learning, Wiley India, 2015.
2 S. Rajasekaran and G. Aghila, Machine Learning: An Algorithmic Perspective, Chapman and Hall/CRC,2018
3 Chandra Shekhar Yadav, S. Ramakrishnan, and U. Rajendra Acharya, Machine Learning: Concepts, Methodologies, Tools and Applications, Springer 2018.

REFERENCE BOOKS:

1 Ethem Alpaydin, Introduction to Machine Learning, MIT Press 2010
2 Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006
3 Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press 2012.

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)