Sri Krishnadevaraya University
College of Engineering & Technology,Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering
Academic Regulations (R23) for B. Tech (Regular-Full time)
(Effective for the students admitted into I year from the Academic Year 2023-24 onwards)

1. Award of the Degree

(a) Award ofthe B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:
- i Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).
- ii Registers for 160 credits and secures all 160 credits.

(b) Award of B.Tech. degree with Honors if he/she fulfils the following:
- i. Student secures additional 15 credits fulfilling all the requisites of a B.Tech. programi.e., 160 credits.
- ii. Registering for Honors is optional.
- iii. Honors is to be completed simultaneously with B.Tech. programme.

(c) Programs offered by the College:
The following programs are offered at present as specializations for the B. Tech. course from 2023-2024.

S. No.	Branch	Program Code
01.	Computer Science & Engineering	01
02.	Electronics and Communication Engineering	02
03.	Mechanical Engineering	03
04.	Electrical and Electronics Engineering	04
05.	Civil Engineering	05

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 1 a) i).

3. Admissions

Admission to the B. Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. Program related terms

Credit: A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

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Credit Defin ition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

a) Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.

b) Choice Based Credit System (CBCS): The CBCS provides a choice for students to select from the prescribed courses.

5. Semester/Credits:

i) A semester comprises 90 working days excluding mid-semester Examination and End Examination dates.An academic year is divided into two semesters.

ii) The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.

iii) Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

6. Structure of the Undergraduate Programme

All courses offered for the undergraduate program (B. Tech.) are broadly classified as follows:

S.No.	Category	Breakup of Credits (Total 160)	Percentage of total credits	AICTE Recommendation (%)
1.	Humanities and Social Science including Management (HM)	13	8 %	8 – 9%
2.	Basic Sciences (BS)	20	13 %	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	54.5	34 %	30 – 36%
5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21 %	19 - 23%
6.	Internships & Project work (PR)	16	10 %	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

7. Course Classification:

All subjects/ courses offered for the undergraduate programme in Engineering & Technology (B.Tech. degree programmes) are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Foundation Courses	Foundation courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses
2.	Core Courses	Professional Core Courses (PC)	Includes subjects related to the parent discipline/department/branch of Engineering
3.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	interdisciplinary/job-oriented/domain courses which are relevant to the industry
4.	Project & Internships	Project	B.Tech. Project or Major Project
		Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5.	Audit Courses	Mandatory non-credit courses	Covering subjects of developing desired attitude among the learners

8. Programme Pattern

i. The total duration of the B. Tech (Regular) Programme is four academic years.
ii. Each academic year of study is divided into two semesters.
iii. The minimum number of instruction days in each semester is 90 days excluding mid-semester Examination and End Examinationdates.
iv. There shall be a mandatory student induction program for freshers, with a three- week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.
v. Health/wellness/yoga/sports and NSS /NSS /Scouts & Guides / Community service activities are made mandatory as credit courses for all the undergraduate students.
vi. Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.
vii. Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.
viii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.
ix. Professional Elective Courses include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses can lead to students

specializing in emerging areas within the chosen field of study.

x. A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

xi. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.

xii. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to theindustry are integrated into the curriculum of all disciplines. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focuson the basic and advanced skills related to the domain/interdisciplinary courses and the other shallbe a soft skills course.

xiii. Students shall undergo mandatory summer internships, for a minimum of eight weeks duration at the end of the second and third year of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.

xiv. There shall also be mandatory full internship in the final semester of the programme along with the project work.

xv. An undergraduate degree with Honors is introduced by the University for the students having good academic record.

xvi. Each college shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

xvii. Each college shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/GATE/ other competitive exams etc.

xviii. Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

9. Evaluation Process

The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 50 marks, Full Internship &Project work in final semester shall be evaluated for 200 marks, mandatory courses with no credits shall be evaluated for 30 mid semester marks. A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together for the theory, practical, design, drawing subject or project etc. In the case of a mandatory course, he/she should secure 40% of the total marks.

Theory Courses

Assessment Method	**Marks**
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

i) For the theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.

ii) For practical subjects, the distribution shall be 30 marks for the Internal Evaluation and 70 marks for the End- Examination.

iii) If any course contains two different branch subjects, the syllabus shall be written in two parts with

3 units each (Part-A and Part-B) and external examination question paper shall be set with two parts each for 35 marks.

iv) If any subject has boththeory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

a) Continuous Internal Evaluation

i) For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.

ii) Objective paper shall contain 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of question. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

Note:

- The objective paper shall be prepared in line with the quality of competitive examinations questions.
- The subjective paper shall contain 3 either or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted by the respective institution on the day of subjective paper test.
- Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.

iii) If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.

iv) The first midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

v) Finalized mid marks of first and second mid semesters shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 25 Marks obtained in second mid: 20

Final Marks: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the finalized mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other. For Example:

Marks obtained in first mid: Absent Marks obtained in second mid: 25

Final Marks: (25x0.8) + (0x0.2) =20

b) End Examination Evaluation:

End examination of theory subjects shall have the following pattern:

i) There shall be 6 questions and all questions are compulsory.

ii) Question I shall contain 10 compulsory short answer questions for a total of 20marks such that each question carries 2 marks.

iii) There shall be 2 short answer questions from each unit.

a) In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Students shall answer any one of them.

iv) The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

End examination of theory subjects consisting of two parts of different subjects, for Example: Basic Electrical &Electronics Engineering shall have the following pattern:

i) The question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.

ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1mark.

iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Students shall answer any one of them.

iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

Practical Courses

Assessment Method	**Marks**
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

b) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and the end examination shall be for 70 marks.

c) Day-to-daywork in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/viva and 15 marks for the internal test.

d) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.

- Procedure: 20 marks
- Experimental work & Results: 30 marks
- Viva voce: 20 marks.

In a practical subject consisting of two parts (Eg: Basic Electrical &Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3 hours. Mid semester examination shall be evaluated as above for 30 marks in each part and final mid semester marks shall be arrived byconsidering the average of marks obtained in two parts.

e) For the subject having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for mid semester evaluation and 70 for end examination.

Assessment Method	**Marks**
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better mid marks and

20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final sessional marks for the subject.

The end examination pattern for Engineering Graphics shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing, multiple branches, etc is mentioned along with the syllabus.

f) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case the student fails, a re-examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

g) The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

10. Skill oriented Courses

i) There shall be five skill-oriented courses offered during III to VII semesters.

ii) Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.

iii) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

iv) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.

v) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

vi) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the University at the beginning of the semester. The principal of the respective college shall forward such proposals to the University for approval.

vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the University.

11. Massive Open Online Courses (MOOCs):

A Student must pursue and complete one course compulsorily through MOOCs approved by the University. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.

A student shall register for the course (Minimum of 12 weeks) offered through MOOCs with the approval of the Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate bypassing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. The examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the university.

Necessary amendments to the rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

12. Credit Transfer Policy

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

i) The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
ii) Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
iii) The credit transfer policy will be applicable to the Professional & Open Elective courses only.
iv) The concerned department shall identify the courses permitted for credit transfer.
v) The University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
vi) The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
vii) The university shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the university will re-issue the marks sheet for such students.
viii) Students pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.
ix) The institution shall submit the following to the examination section of the university:
a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
b) Undertaking form filled in by the students for credit transfer.
x) The universities shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the University from time to time.

13. Academic Bank of Credits (ABC)

The University has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

i. provide option of mobility for learners across the universities of their choice
ii. provide option to gain the credits through MOOCs from approved digital platforms.
iii. facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
iv. execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

14. Mandatory Internships

Summer Internships: Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / University shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure a minimum of 40% of marks for successful completion. In case a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

Full Semester Internship and Project work: In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit a project report on the work carried out during the internship.

The project report shall be evaluated by an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of an internal examiner and external examiner appointed by the University and is evaluated for 140 marks.

The college shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

15. Guidelines for offering a Minor.

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain a degree in Minor in another stream.

i) The Minor program requires the completion of 12 credits in Minor stream chosen.

ii) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.

iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

Note: A total of 4 (Four) Open Electives are offered in the curriculum. A student can complete the requirement for Minor by opting for the courses offered through various verticals/tracks under Open Electives.

16. Guidelines for offering Honors.

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is the best choice for academically excellent students having a good academic record and interest towards higher studies and research.

i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.

ii) A student shall earn an additional 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).

iii) A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.

iv) The concerned Principal of the college shall arrange separate class work and timetable of the courses offered under the Honors program.

v) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.

vi) Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.

vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.

viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.

ix) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for an Honors degree programme.

x) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xi) Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

Enrolment into Honors:

i) Students of a Department/Discipline are eligible to opt for Honors program offered by the

same Department/Discipline

ii) The enrolment of students into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7.0 CGPA without any backlog subjects will be permitted to register for Honors.

iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.

iv) Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.

v) Honors are to be completed simultaneously with a Major degree program.

Registration for Honors:

i) The eligible and interested students shall apply through the Head of the Department (HOD) of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.

ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.

iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

iv) There is no fee for registration of subjects for Honors program offered offline at the respective institutions.

17. Attendance Requirements:

i) A student shall be eligible to appear for the University external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% ofattendance in aggregate ofall the subjects.
b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

ii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.

iii) A stipulated fee shall be payable towards condonation of shortage of attendance to the University.

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

v) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.

vi) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

vii)If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

viii) For induction programme attendance shall be maintained as per AICTE norms.

18. Promotion Rules:

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 16.

i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.

ii) A student will be promoted from II to III year if he/she fulfils the academic requirement ofsecuring 40% ofthe credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) up to in the subjects that have been studied up to III semester.

iii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit)in the subjects that have been studied up to V semester.

And in case a student is detained for want of credits for a particular academic year by ii) & iii) above,

the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

iv) When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such a case, he/she shall be in the academic regulations into which he/she is readmitted.

19. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points Assigned
90 & above	Superior	10
80 - 89	A (Excellent)	9
70 - 79	B (Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative GradePoint Average (CGPA):

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

$$SGPA = \Sigma (Ci \times Gi)/\Sigma Ci$$

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

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

$$CGPA = \Sigma (Ci \times Si)/ \Sigma Ci$$

where "Si" is the SGPA of the i^{th} semester and Ci is the total number of credits up to that semester.

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

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

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

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

Award of Class:

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

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 5.0 < 5.5

CGPA to Percentage conversion Formula – (CGPA – 0.5) x 10

20. With–holding of Results

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

21. Multiple Entry / Exit Option

a. Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10 -credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10 -credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii) **Bachelor of Science (in Field of study/discipline)** i.e., **B.Sc. Engineering in (Field of study/discipline)**- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

b. Entry Policy:

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

Note: The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

22. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for

the maximum time for graduation. The principal of the respective college shall forward such proposals submitted by the students to the University. An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

23. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section **2** and they will follow the academic regulations into which they are readmitted.

24. Minimum Instruction Days for a Semester:

The minimum instruction days including exams for each semester shall be 90 days excluding mid semester examination and End Examination dates.

25. Medium of Instruction:

The medium of instruction of the entire B. Tech undergraduate programme in Engineering &Technology (including examinations and project reports) will be in English only.

26. Student Transfers:

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

27. General Instructions:

i. The academic regulations should be read as a whole for purpose of any interpretation.
ii. Malpractices rules-nature and punishments are appended.
iii. Where the words “he”, “him”, “his”, occur in the regulations, theyalso include “she”, “her”, “hers”, respectively.
iv. The Universities may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
v. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Vice-Chancellor / Head of the institution is final.

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Academic Regulations (R23) for B. Tech (Lateral Entry Scheme)
(Effective for the students admitted into II year from the Academic Year 2024-25 onwards)

1. Award of the Degree

(a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:
(i)Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
(ii)Registers for 120 credits and secures all 120 credits.

(b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:
Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.
(i) Registering for Honors is optional.
(ii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.

3. Minimum Academic Requirements

The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.**2.**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.

ii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.
And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

4. Course Pattern

i) The entire course of study is three academic years on semester pattern.

ii) A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

iii) When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

5. All other regulations applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

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SKUCET Curriculum
B. Tech Course Structure – R23
ELECTRICAL AND ELECTRONICS ENGINEERING

Semester – 0 Common for All Branches of Engineering				
S.No	**Course No**	**Course Name**	**Category**	**L-T-P-C**
1		Physical Activities -- Sports, Yoga and Meditation,Plantation	MC	0-0-6-0
2		Career Counselling	MC	2-0-2-0
3		Orientation to all branches -- career options, tools,etc.	MC	3-0-0-0
4		Orientation on admitted Branch -- correspondinglabs, tools and platforms	EC	2-0-3-0
5		Proficiency Modules & Productivity Tools	ES	2-1-2-0
6		Assessment on basic aptitude and mathematicalskills	MC	2-0-3-0
7		Remedial Training in Foundation Courses	MC	2-1-2-0
8		Human Values & Professional Ethics	MC	3-0-0-0
9		Communication Skills -- focus on Listening,Speaking, Reading, Writing skills	BS	2-1-2-0
10		Concepts of Programming	ES	2-0-2-0

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Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
I Year I Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T- P**	**Credits**
1.		Communicative English	BS&H	2-0-0	2
2.		Linear Algebra & Calculus	BS&H	3-0-0	3
3.		Engineering Physics	BS&H	3-0-0	3
4.		Basic Civil & Mechanical Engineering	ES	3-0-0	3
5.		Introduction to Programming	ES	3-0-0	3
6.		Engineering Workshop	BS&H	0-0-3	1.5
7.		Communicative English Lab	BS&H	0-0-2	1
8.		Engineering Physics Lab	ES	0-0-2	1
9		Introduction to Programming lab	ES	0-0-3	1.5
10		Health and Wellness, Yoga and Sports	BS&H	0-0-2	0.5
				Total	**19.5**

Category	**CREDITS**
Engineering Science Courses	8.5
Basic Science and Humanities	11
TOTAL CREDITS	**19.5**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
I Year II Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Chemistry	BS&H	3-0-0	3
2.		Differential Equations and Vector calculus	BS & H	3-0-0	3
3.		Basic Electrical & Electronics Engineering	ES	3-0-0	3
4.		Engineering Graphics	ES	1-0-4	3
5.		Electrical Circuit Analysis -I	PC	3-0-0	3
6.		IT Workshop	ES	0-0-2	1
7.		Electrical & Electronics Engineering Workshop	ES	0-0-3	1.5
8.		Chemistry Lab	BS& H	0-0-2	1
9.		Electrical Circuit Analysis -I Lab	PC	0-0-3	1.5
10.		NCC, NSS, community Service	BS&H	0-0-1	0.5
				Total	**20.5**

Category	**CREDITS**
Basic Sciences and Humanities course	7.5
Engineering Science Courses	8.5
Professional Core Courses	4.5
TOTAL CREDITS	**20.5**

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Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
II Year I Semester					
S. No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Complex Variables & Numerical Methods	BS&H	3-0-0	3
2.		Universal human values – understanding harmony and Ethical human conduct	BS&H	2-1-0	3
3.		Electromagnetic Field Theory	ES	3-0-0	3
4.		Electrical Circuit Analysis-II	PC	3-0-0	3
5.		DC Machines & Transformers	PC	3-0-0	3
6.		Electrical Circuit Analysis-II Lab	PC	0-0-3	1.5
7.		DC Machines & Transformers Lab	BS&H	0-0-3	1.5
8.		Data Structures	SC	0-1-2	2
				Total	**20**

Category	**CREDITS**
Engineering Science Courses	3
Basic Science and Humanities	6
Professional Core	9
Skill Course	2
TOTAL CREDITS	**20**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
II Year II Semester					
S. No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Managerial Economics & Financial Analysis	MG	2-0-0	2
2.		Analog Circuits	ES	3-0-0	3
3.		Power Systems-I	PC	3-0-0	3
4.		Induction and Synchronous Machines	PC	3-0-0	3
5.		Control Systems	PC	3-0-0	3
6.		Induction and Synchronous Machines Lab	PC	0-0-3	1.5
7.		Control Systems Lab	PC	0-0-3	1.5
8.		Circuit Simulation and Analysis using Pspice	SC	0-1-2	2
9.		Design Thinking and Innovation	BS&H	0-1-2	2
10.		Environmental Science	MC	2-0-0	-
				Total	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation					

Category	**Credits**
Basic Sciences and Humanities course	2
Engineering Science Courses	3
Management Course	2
Skill Course	2
Professional Core Courses	12
TOTAL CREDITS	**21**

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Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
III Year 1 Semester					
S. No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Power Electronics	PC	3-0-0	3
2.		Digital Circuits	PC	3-0-0	3
3.		Power Systems-II	PC	3-0-0	3
4.		1. Signals and Systems 2. Computer Organization 3.Utilization of Electrical Energy	PE-I	3-0-0	3
5.		1. Electrical Safety Practices and Standards 2. Electrical Technology 3. FPGA Based Controller Design	OE-I	3-0-0	3
6.		Power Electronics Lab	PC	0-0-3	1.5
7.		Analog and Digital Circuits Lab	PC	0-0-3	1.5
8.		Circuit Simulation and Analysis using Pspice	SC	0-1-2	2
9.		Tinkering Lab	ES	0-0-2	1
10.		Evaluation of Community Service Project	-	-	2
				Total	**23**

Category	**Credits**
Open Elective Courses	3
Engineering Science Courses	1
Community Service Project	2
Skill Course	2
Professional Core Courses	12
Professional Elective Courses	3
TOTAL CREDITS	**23**

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Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
III Year 2 Semester					
S. No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Electrical Measurements and Instrumentation	PC	3-0-0	3
2.		Microprocessors and Microcontrollers	PC	3-0-0	3
3.		Power System Analysis	PC	3-0-0	3
4.		1. AI & ML for Electrical Engineering 2. Programmable Logic Controllers 3. Switchgear and Protection	PE-II	3-0-0	3
5.		1. Communication systems 2. Electric Drives 3. Renewable and Distributed Energy Technologies	PE-III	3-0-0	3
6.		1. Renewable Energy Sources 2. Electric Vehicles 3. Generation of Electric Power	OE-II	0-0-3	3
7.		Electrical Measurements and Instrumentation Lab	PC	0-0-3	1.5
8.		Microprocessors and Microcontrollers Lab	PC	0-1-2	1.5
9.		Applications of Soft Computing Tools in Electrical Engineering	SC	0-0-2	2
10.		Technical Paper Writing & IPR	-	-	-
				Total	**23**
Mandatory Internship of 08 weeks duration during Summer Vacation					

Category	**Credits**
Open Elective Courses	3
Skill Course	2
Professional Core Courses	12
Professional Elective Courses	6
TOTAL CREDITS	**23**

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Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
IV Year 1 Semester					
S. No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Power System Operation and Control	PC	3-0-0	3
2.		Management Science	MC	2-0-0	2
3.		1. Digital Signal Processing 2. Electric Vehicle Technology 3. HVDC & FACTS	PE-IV	3-0-0	3
4.		1. Modern Control Theory 2. Switched Mode Power Conversion 3. Electrical Distribution System	PE-V	3-0-0	3
5.		1. Smart Grid Technologies 2. Design of Photo Voltaic systems 3. Concepts of Power Quality	OE-III	3-0-0	3
6.		1. Electrical & Electronics Instrumentation 2.Intelligent Control Techniques 3. Basics of Power Electronics	OE-IV	3-0-0	3
7.		Power Systems and Simulation Lab	SC	0-0-4	2
8.		Gender Sensitization / Constitution of India	-	2-0-0	-
9.		Evaluation of Industry Internship	-	0-0-2	2
Total					**21**

Category	**Credits**
Professional Elective Courses	6
Open Elective Courses	6
Management Course	2
Skill Course	2
Professional Core Courses	3
Evaluation of Industry Internship	2
TOTAL CREDITS	**21**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
IV Year 2 Semester					
S. No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Internship	PR	0-0-0	4
		Project	PR	0-0-0	8

Category	Credits
Internship	4
Project	8
TOTAL CREDITS	**12**

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COURSES OFFERED FOR HONOURS DEGREE IN EEE

S.No.	Course No.	Course Name	L	T	P	Credits
1.		Advance Power Electronics	3	0	0	3
2.		Distributed Generation & Micro Grids	3	0	0	3
3.		Battery Management Systems	3	0	0	3
4.		Grid Integration of Renewable Energy Systems	3	0	0	3
5.		Electric Vehicle Technology & Mobility	3	0	0	3
6		Advanced Power Electronics Lab	0	0	3	1.5
7		Grid Integration Of Renewable Energy Systems Lab	0	0	3	1.5
Total Credits						**18**

COURSES OFFERED FOR MINORS OFFERED BY EEE

S.No	Course Code	Course Name	L	T	P	Credits
1.		DC Machines	3	0	0	3
2.		AC Machines	3	0	0	3
3.		Electrical Measurements & instrumentation	3	0	0	3
4.		Basics of Control systems	3	0	0	3
5		Power Electronics	3	0	0	3
6		Electrical Machines Laboratory	0	0	3	1.5
7		Control Systems and Instrumentation Laboratory	0	0	3	1.5

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Sri Krishnadevaraya University College of Engineering & Technology					
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I Year I Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T- P**	**Credits**
1.		Communicative English	BS&H	2-0-0	2
2.		Linear Algebra & Calculus	BS&H	3-0-0	3
3.		Engineering Physics	BS&H	3-0-0	3
4.		Basic Civil & Mechanical Engineering	ES	3-0-0	3
5.		Introduction to Programming	ES	3-0-0	3
6.		Engineering Workshop	BS&H	0-0-3	1.5
7.		Communicative English Lab	BS&H	0-0-2	1
8.		Engineering Physics Lab	ES	0-0-2	1
9		Introduction to Programming lab	ES	0-0-3	1.5
10		Health and Wellness, Yoga and Sports	BS&H	0-0-2	0.5
				Total	**19.5**

Category	**CREDITS**
Engineering Science Courses	8.5
Basic Science and Humanities	11
TOTAL CREDITS	**19.5**

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Course Code	COMMUNICATIVE ENGLISH (Common to All Branches of Engineering)	L	T	P	C
		2	0	0	2

I Year 1st Semester

Course Objectives:

The main objective of introducing this course, *Communicative English*, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

Course Outcomes (CO):

CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues.
CO2: Apply grammatical structures to formulate sentences and correct word forms.
CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions.
CO4: Evaluate reading / listening texts and to write summaries based on global comprehension of these texts.
CO5: Create a coherent paragraph, essay, and resume.

UNIT - I

Lesson: HUMAN VALUES: Gift of Magi **(Short Story)**

Listening: Identifying the topic, the context, and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT - II

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure ofa paragraph - Paragraph writing (specific topics) **Grammar:**Cohesive devices - linkers, use of articles and zero article; prepositions. **Vocabulary:** Homonyms, Homophones, Homographs

UNIT - III

Lesson: BIOGRAPHY: Elon Musk

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Readinga text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

UNIT IV

Lesson: INSPIRATION: The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Letter Writing: Official Letters, Resumes

Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice

Vocabulary: Words often confused, Jargons

UNIT V

Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series ofrelevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts

Reading: Reading comprehension.

Writing: Writing structured essays on specific topics.

Grammar: Editing short texts –identifying and correcting common errors in grammar andusage (articles, prepositions, tenses, subject verb agreement)

Vocabulary: Technical Jargons

Textbooks:

- Pathfinder: Communicative English for Undergraduate Students, 1st Edition, OrientBlack Swan, 2023 (Units 1,2 & 3)
- Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge,2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge UniversityPress, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building aSuperior Vocabulary. Anchor, 2014.

Web Resources:

GRAMMAR:

- www.bbc.co.uk/learningenglish
- https://dictionary.cambridge.org/grammar/british-grammar/
- www.eslpod.com/index.html
- https://www.learngrammar.net/
- https://english4today.com/english-grammar-online-with-quizzes/
- https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

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Course Code	LINEAR ALGEBRA & CALCULUS (Common to All Branches of Engineering)	L	T	P	C
		3	0	0	3

I Year 1st Semester

Course Objectives:

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications

Course Outcomes (CO):

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

CO1: Develop and use of matrix algebra techniques that are needed by engineers for practical applications.

CO2: Utilize mean value theorems to real life problems.

CO3: Familiarize with functions of several variables which is useful in optimization.CO4: Learn important tools of calculus in higher dimensions.

CO5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

UNIT - I	Matrices	

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solvingsystem of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT II	Eigenvalues, Eigenvectors and Orthogonal Transformation	

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

UNIT - III	Calculus	

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems

UNIT - IV	Partial differentiation and Applications (Multi variable calculus)	

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions oftwo variables. Jacobians, Functional dependence, maxima and minima of functionsof two variables, method of Lagrange multipliers.

UNIT - V	Multiple Integrals (Multi variable Calculus)	

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10thEdition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, PearsonPublishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, AlphaScienceInternational Ltd., 2021 5th Edition(9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5thEdition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9thedition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. ChandPublications,2014, Third Edition (Reprint 2021)

Sri Krishnadevaraya University
College of Engineering & Technology,Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ENGINEERING PHYSICS (Common for all branches of Engineering)	L	T	P	C
		3	0	0	3
I Year 1st Semester					

Course Objectives:

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes (CO):

CO1: Analyze the intensity variation of light due to polarization, interference, and diffraction.
CO2: Familiarize with the basics of crystals and their structures.
CO3: Explain fundamentals of quantum mechanics and apply it to one dimensional motion ofparticles.
CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials.
CO5: Explain the basic concepts of Quantum Mechanics and the band theory of solids.CO6: Identify the type of semiconductor using Hall effect

UNIT - I **Wave Optics**

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.
Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT - II **Crystallography and X-ray diffraction**

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.
1. **ray diffraction**: Bragg's law - X-ray Diffractometer – crystal structure determination byLaue's and powder methods

UNIT - III **Dielectric and Magnetic Materials**

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss
Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT - IV **Quantum Mechanics and Free electron Theory**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.
Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits anddemerits) – Quantum free electron theory – electrical conductivity based on qua n_2t u_1 m free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT - V	**Semiconductors**

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

Textbooks:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS ArunMurthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books:

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html

Sri Krishnadevaraya University
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Electrical and Electronics Engineering

Course Code	BASIC CIVIL AND MECHANICAL ENGINEERING (Common to All branches of Engineering)	L	T	P	C
		3	0	0	3

I Year 1st Semester

Course Objectives:

- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation'seconomy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques

Course Outcomes (CO):

After the completion of the course students will be able to
CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
CO2: Know the concepts of surveying and to understand the measurement of distances, angles, and levels through surveying.
CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.
CO4: Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.
CO5: Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

PART A: BASIC CIVIL ENGINEERING

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering-Hydraulics and Water Resources Engineering - Environmental Engineering- Scope of each discipline - Building Construction and Planning- Construction Materials- Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

UNIT II

Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levellingand bearings-Contour mapping.

UNIT - III

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage andConveyance Structures (Simple introduction to Dams and Reservoirs

Textbooks:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt.Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers.2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition

Reference Books:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, KhannaPublishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, KhannaPublishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand andBrothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

Course Objectives:

The students after completing the course are expected to

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.

Provide an overview of different thermal and mechanical transmission systems andintroduce basics of robotics and its applications

Course Outcomes: On completion of the course, the student should be able toCO1: Understand the different manufacturing processes.

CO2: Explain the basics of thermal engineering and its applications.

CO3: Describe the working of different mechanical power transmission systems and power plants.

CO4: Describe the basics of robotics and its applications

UNIT I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society-Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT II

Manufacturing Processes: Principles of Casting, Forming, joining processes, Machining.

Thermal Engineering – Introduction to Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, Components of Electric and Hybrid Vehicles.

UNIT III

Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants.

Introduction to Robotics - Joints & links, configurations, and applications of robotics. (Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

Textbooks:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India)Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd

Reference Books:

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak MPandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, TataMcGraw Hill publications (India) Pvt. Ltd.
5. Elements of Mechanical Engineering, - Sadhu Singh, S Chand Publications,
6. Elements of Mechanical Engineering - R. K. Rajput, Laxmi Publications as textbooks.

Sri Krishnadevaraya University
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Electrical and Electronics Engineering

Course Code	INTRODUCTION TO PROGRAMMING (Common to All branches of Engineering)	L	T	P	C
		3	0	0	3

I Year 1st Semester

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

Course Outcomes (CO):

A student after completion of the course will be able to
CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.
CO2: Analyse a problem and develop an algorithm to solve it.
CO3: Implement various algorithms using the C programming language. CO4: Understand more advanced features of C language.
CO5: Develop problem-solving skills and the ability to debug and optimize the code

UNIT - I	Introduction to Programming and Problem Solving	

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms

UNIT II	Control Structures	

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

UNIT - III	Arrays and Strings	

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

UNIT - IV	Pointers & User Defined Data types	

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

UNIT - V	Functions & File Handling	

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling

Note: The syllabus is designed with C Language as the fundamental language of implementation.

Textbooks:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education,1996

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-HillEducation, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad,CENGAGE, 3rd edition

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Electrical and Electronics Engineering

Course Code	ENGINEERING WORKSHOP (Common to All branches of Engineering)	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

Course Objectives:

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course Outcomes (CO):

CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting,carpentry, foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice

List of Experiments:

- **Demonstration:** Safety practices and precautions to be observed in workshop.
- **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
  a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
- **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
  Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
- **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
  a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
- **Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
  a) Parallel and series b) Two-way switch c) Godown lighting
  d) Tube light e) Three phase motor f) Soldering of wires
- **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
- **Welding Shop:** Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
- **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Textbooks:

- Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
- A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

- Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media
- Promoters and Publishers, Mumbai. 2007, 14th edition
- Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
- Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; AtulPrakashan, 2021-22.

Sri Krishnadevaraya University
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Electrical and Electronics Engineering

Course Code	COMMUNICATIVE ENGLISH LAB (Common to All Branches of Engineering)	L	T	P	C
		0	0	2	1
I Year 1st Semester					

Course Objectives:

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews

Course Outcomes (CO):

CO1: Understand the different aspects of the English language proficiency with emphasison LSRW skills.
CO2: Apply communication skills through various language learning activities.
CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable divisionfor better listening and speaking comprehension.
CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.CO5: Create effective Course Objectives

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:

- Walden Infotech
- Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India,2016
3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed),Kindle, 2013

Web Resources:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured

8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc

https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Sri Krishnadevaraya University
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Electrical and Electronics Engineering

Course Code	ENGINEERING PHYSICS LAB (Common to All Branches of Engineering)	L	T	P	C
		0	0	2	1

I Year 1st Semester

Course Objectives:

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes (CO):

The students will be able to
CO1: Operate optical instruments like travelling microscope and spectrometer.
CO2: Estimate the wavelengths of different colours using diffraction grating.
CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance.
CO4: Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
CO5: Calculate the band gap of a given semiconductor. CO6: Identify the type of semiconductor using Hall effect.

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum usingdiffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Studythe variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee'sMethod.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Halleffect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using acompound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsionalpendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde'sexperiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWOexperiments may be conducted in virtual mode.

References:

- A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. ChandPublishers, 2017.

Web Resources

- www.vlab.co.in
- https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

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Electrical and Electronics Engineering

Course Code	INTRODUTION TO PROGRAMMING LAB (Common to All Branches of Engineering)	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

Course Objectives:

- The course aims to give students hands – on experience and train them on the concepts of theC- programming language

Course Outcomes (CO):

- CO1: Read, understand, and trace the execution of programs written in C language. CO2: Select the right control structure for solving the problem.
- CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.
- CO4: Develop, Debug and Execute programs to demonstrate the applications ofarrays, functions, basic concepts of pointers in C

List of Experiments:

UNIT I WEEK 1

Objective: Getting familiar with the programming environment on the computer and writingthe first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()
iv)

WEEK 2

Objective: Getting familiar with how to formally describe a solution to a problem in a seriesof finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

WEEK 3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object.

UNIT II WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constantsand operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.
a. A+B*C+(D*E) + F*G
b. A/B*C-B+A*D/3
c. A+++B---A
d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and
for loop in addition to structured jump constructs like break and continue including when eachof these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.
vi)

UNIT III WEEK 7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7:1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK 8:

Objective: Explore the difference between other arrays and character arrays that can be usedas Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

UNIT IVWEEK 9:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details alongwith the total.
v) Write a C program to implement realloc()

WEEK 10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10 : Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type.

UNIT V WEEK 11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler'smethod

WEEK 12:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK 13:

Objective: Explore the basic difference between normal and pointer variables, Arithmeticoperations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
iv) Write a C program to find no of lowercase, uppercase, digits and othercharacters using pointers.

WEEK14:

Objective: To understand data files and file handling with various file I/O functions. Explore thedifferences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() andfwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-linearguments.
v) Find no. of lines, words, and characters in a file
vi) Write a C program to print last n characters of a given file.

Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

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Electrical and Electronics Engineering

Course Code	HEALTH AND WELLNESS, YOGA AND SPORTS (Common to All branches of Engineering)	L	T	P	C
		0	0	1	0.5

I Year 1st Semester

Course Objectives:

- The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality

Course Outcomes (CO):

After completion of the course the student will be able to
CO1: Understand the importance of yoga and sports for Physical fitness and sound health.
CO2: Demonstrate an understanding of health-related fitness components.
CO3: Compare and contrast various activities that help enhance their health.
CO4: Assess current personal fitness levels.
CO5: Develop Positive Personality

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
Practicing general and specific warm up, aerobics
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping andrunning.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning,2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to SurvivingAnywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. HumanKinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as manyas Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

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Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
I Year II Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Chemistry	BS&H	3-0-0	3
2.		Differential Equations and Vector calculus	BS & H	3-0-0	3
3.		Basic Electrical & Electronics Engineering	ES	3-0-0	3
4.		Engineering Graphics	ES	1-0-4	3
5.		Electrical Circuit Analysis -I	PC	3-0-0	3
6.		IT Workshop	ES	0-0-2	1
7.		Electrical & Electronics Engineering Workshop	ES	0-0-3	1.5
8.		Chemistry Lab	BS& H	0-0-2	1
9.		Electrical Circuit Analysis -I Lab	PC	0-0-3	1.5
10.		NCC, NSS, community Service	BS&H	0-0-1	0.5
				Total	**20.5**

Category	**CREDITS**
Basic Sciences and Humanities course	7.5
Engineering Science Courses	8.5
Professional Core Courses	4.5
TOTAL CREDITS	**20.5**

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Electrical and Electronics Engineering

Course Code	CHEMISTRY	L	T	P	C
	(Common to EEE, ECE, CSE, IT & allied branches)	3	0	0	3
I Year 2nd Semester					

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches.

Course Outcomes (CO):

At the end of the course, the students will be able to:
CO1: Compare the materials of construction for battery and electrochemical sensors.
CO2: Explain the preparation, properties, and applications of thermoplastics & thermosetting &elastomers conducting polymers.
CO3: Explain the principles of spectrometry, slc in separation of solid and liquid mixtures. **CO4:** Apply the principle of Band diagrams in the application of conductors andsemiconductors.
CO5: Summarize the concepts of Instrumental methods.

UNIT - I	Structure and Bonding Models	

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronucleardiatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II	Modern Engineering materials	

Semiconductors – Introduction, basic concept, application Super Conductors-Introduction basic concept, applications.
Supercapacitors: Introduction, Basic Concept-Classification – Applications.
Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

UNIT - III	Electrochemistry and Applications	

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivitycell, conductometric titrations (acid-base titrations).
Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteriesincluding cell reactions; Fuel cells, hydrogen-oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT - IV	Polymer Chemistry	

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.
Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.
Elastomers–Buna-S, Buna-N–preparation, properties and applications.
Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT - V	Instrumental Methods and Applications	

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

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Electrical and Electronics Engineering

Course Code	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common for all branches of Engineering)	L	T	P	C
		3	0	0	3

I Year 2nd Semester

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead theminto advanced level by handling various real-world applications.

Course Outcomes (CO):

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

CO1: Solve the differential equations related to various engineering fields.
CO2: Identify solution methods for partial differential equations that model physical processes.
CO3: Interpret the physical meaning of different operators such as gradient, curl and divergence.
CO4: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT - I **Differential equations of first order and first degree**

Linear differential equations – Bernoulli's equations- Exact equations and equations reducibleto exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT - II **Partial Differential Equations**

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion

UNIT - III **Dielectric and Magnetic Materials**

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

UNIT - IV **Vector differentiation**

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V **Vector integration**

LWith integral-circulation-work done, surface integral-flux, Green's theorem in the plane(without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10thEdition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones andBartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018,5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha ScienceInternational Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

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Electrical and Electronics Engineering

Course Code	BASIC ELECTRICAL & ELECTRONICS ENGINEERING (Common to All branches of Engineering)	L	T	P	C
		3	0	0	3

I Year 2nd Semester

Course Objectives:

- To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes (CO):

After the completion of the course students will be able to

CO1: Remember the fundamental laws, operating principles of motors, generators, MC and MIinstruments.

CO2: Understand the problem-solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.

CO3: Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.

CO4: Analyze different electrical circuits, performance of machines and measuring instruments.

CO5: Evaluate different circuit configurations, Machine performance and Power systems operation.

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I — **DC & AC Circuits**

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL &KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II — **Machines and Measuring Instruments**

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT - III — **Energy Resources, Electricity Bill & Safety Measures**

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

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Textbooks:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, FirstEdition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti,Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, ThirdEdition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019,Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford UniversityPress, 2017

Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications,2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

To teach the fundamentals of semiconductor devices and its applications, principles ofdigital electronics.

UNIT I SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics ofPN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Graycode, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionalityof Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops.

Textbooks:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall,India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional F lo 4w7 Version,Pearson Education,2009.

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Electrical and Electronics Engineering

Course Code	ENGINEERING GRAPHICS	L	T	P	C
	(Common to All branches of Engineering)	1	0	4	3

I Year 2nd Semester

Course Objectives:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills ofthe students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

Course Outcomes (CO):

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
CO3: Understand and draw projection of solids in various positions in first quadrant.CO4: Explain principles behind development of surfaces.
CO5: Prepare isometric and perspective sections of simple solids.

UNIT - I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.
Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.
Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.
Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the referenceplanes
Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT - III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simplepositions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallelto both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane, inclined to both the reference planes.

UNIT - IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.
Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone

UNIT - V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.
Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformatio4n8s using Auto CAD (*Not for end examination*).

Textbooks:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016
2. Engineering Drawing by K.L. Narayana & P. Kannaiah Tata Mcgrawhill Publications as textbook
3. Engineering Drawing - R.K. Dhawan, S Chand Publications

Reference Books:

1. Engineering Drawing - K.R. Gopala Krishna, Subhas publications, as reference books .
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, TataMcGraw Hill, 2017.

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Electrical and Electronics Engineering

Course Code	ELECTRICAL CIRCUIT ANALYSIS -I (EEE & allied branches)	L	T	P	C
		3	0	0	3

I Year 2nd Semester

Course Objectives:

- To develop an understanding of the fundamental laws, elements of electrical circuits and to apply circuit analysis to DC and AC circuits .

Course Outcomes (CO):

CO1: Remembering the basic electrical elements and different fundamental laws.
CO2: Understand the network reduction techniques, transformations, concept of self- inductance and mutual inductance, phasor diagrams, resonance and network theorems.
CO3: Apply the concepts to obtain various mathematical and graphical representations.
CO4: Analyse nodal and mesh networks, series and parallel circuits, steady state response, different circuit topologies (with R, L and C components).
CO5: Evaluation of Network theorems, electrical, magnetic and single-phase circuits.

UNIT - I	INTRODUCTION TO ELECTRICAL CIRCUITS	

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis.

UNIT II	MAGNETIC CIRCUITS	

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT - III	SINGLE PHASE CIRCUITS	

Characteristics of periodic functions, Average value, R.M.S. value, form factor, representation of a sine function,
concept of phasor, phasor diagrams, node and mesh analysis. Steady state analysis of R, L and C circuits to sinusoidal excitations-response of pure resistance, inductance, capacitance, series RL circuit, series RC circuit, series RLC circuit, parallel RL circuit, parallel RC circuit..

UNIT - IV	RESONANCE AND LOCUS DIAGRAMS	

Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and bandwidth, expression
for half power frequencies; Parallel resonance: Q-factor, selectivity and bandwidth; Locus diagram: RL, RC, RLC with R, L and C variables.

UNIT - V	NETWORK THEOREMS (DC & AC EXCITATIONS)	

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem

Textbooks:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Edition

Reference Books:

1. Fundamentals of Electrical Circuits, Charles K. Alexander and Mathew N.O. Sadiku,Mc Graw Hill Education (India), 2013, Fifth Edition
2. Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Edminister, and
   K. Rao, Mc Graw Hill Education, 2017, Fifth Edition.
3. Electric Circuits, David A. Bell, Oxford University Press, 2009, Seventh Edition.
4. Introductory Circuit Analysis, Robert L Boylestad, Pearson Publications, 2023,Fourteenth Edition.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., 2018,Seventh Revised Edition.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ee81/preview
2. https://nptel.ac.in/courses/108104139
3. https://nptel.ac.in/courses/108106172
4. https://nptel.ac.in/courses/117106108

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Course Code	IT WORKSHOP (Common to all branches of Engineering)	L	T	P	C
		0	0	2	1

I Year 2nd Semester

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes (CO):

CO1: Perform Hardware troubleshooting.
CO2: Understand Hardware components and inter dependencies. CO3: Safeguard computer systems from viruses/worms.
CO4: Document/ Presentation preparation.
CO5: Perform calculations using spreadsheets.

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Labinstructors should verify the work and follow it up with a Viva. Also students need to go throughthe video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Everystudent should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and howto use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) toolword: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview oftoolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeXand Word.

Task 3: Creating project abstract Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech,2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, PearsonEducation, 2012, 2nd edition.
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and KenQuamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition

Sri Krishnadevaraya University
College of Engineering & Technology,Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP (Common to All branches of Engineering)	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations

Course Outcomes (CO):

CO1: Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.
CO2: Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.
CO3: Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.
CO4: Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.
CO5: Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.
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Activities:

Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set,wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
Provide some exercises so that hardware tools and instruments are learned to be usedby the students.

Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter,LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
Provide some exercises so that measuring instruments are learned to be used by thestudents.

Components:
Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.

Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, FirstEdition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti,Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, ThirdEdition

Note: Minimum Six Experiments to be performed.

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PART B: ELECTRONICS ENGINEERING LAB

Course Objectives:

- To impart knowledge on the principles of digital electronics and fundamentals ofelectron devices & its applications.

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

CO1: Identify & testing of various electronic components.

CO2: Understand the usage of electronic measuring instruments. CO3: Plot and discuss the characteristics of various electron devices.CO4: Explain the operation of a digital circuit.

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gatesusing ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters,AC Voltmeters, CROs, all the required active devices.

References:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version,Pearson Education,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

Sri Krishnadevaraya University
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Electrical and Electronics Engineering

Course Code	CHEMISTRY LAB	L	T	P	C
		0	0	2	1

I Year 1st Semester

Course Objectives:

Verify the fundamental concepts with experiments.

Course Outcomes (CO):

At the end of the course, the students will be able to
CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Measure the strength of an acid present in secondary batteries.
CO4: Analyse the IR spectra of some organic compounds.
CO5: Calculate strength of acid in Pb-Acid battery

Experiments

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

Reference:

"Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publicationsby J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

Sri Krishnadevaraya University
College of Engineering & Technology,Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ELECTRICAL CIRCUIT ANALYSIS LAB - I (EEE & allied branches)	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

Course Objectives:

- To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics. It also gives practical exposure to the usage of different circuits with different conditions structures.

Course Outcomes (CO):

CO1: Understand the concepts of network theorems, node and mesh networks, series and parallel resonance and Locus diagrams.
CO2: Apply various theorems to compare practical results obtained with theoretical calculations.
CO3: Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil.
CO4: Analyse different circuit characteristics with the help of fundamental laws and various configurations.

List of Experiments:

1. Verification of Kirchhoff's circuit laws.
2. Verification of node and mesh analysis.
3. Verification of network reduction techniques.
4. Determination of cold and hot resistance of an electric lamp
5. Determination of Parameters ofa choke coil.
6. Determination of self, mutual inductances, and coefficient of coupling
7. Series and parallel resonance
8. Locus diagrams of R-L (L Variable) and R-C (C Variable) series circuits
9. Verification of Superposition theorem
10. Verification of Thevenin's and Norton's Theorems
11. Verification of Maximum power transfer theorem
12. Verification of Compensation theorem
13. Verification of Reciprocity and Millman's Theorems

Reference Books:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, TataMc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Edition

Sri Krishnadevaraya University
College of Engineering & Technology,Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE (Common to All branches of Engineering)	L	T	P	C
		0	0	1	0.5

I Year 2nd Semester

Course Objectives:

- The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service .

Course Outcomes (CO):

After completion of the course the students will be able to
CO1: Understand the importance of discipline, character and service motto.
CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.
CO3: Explore human relationships by analyzing social problems.
CO4: Determine to extend their help for the fellow beings and downtrodden people.
CO5: Develop leadership skills and civic responsibilities

UNIT I Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, careerguidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personaltalents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasingroad map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societalissues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II Nature & CareActivities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Surveyin the village, identification of problems- helping them to solve via media- authorities-experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health,Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and PopulationEducation.
v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, DirectorateGeneral of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering",McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to EnvironmentalEngineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting vivavoce on the subject.

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical & Electronics Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
II Year I Semester					
S. No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Complex Variables & Numerical Methods	BS&H	3-0-0	3
2.		Universal human values – understanding harmony and Ethical human conduct	BS&H	2-1-0	3
3.		Electromagnetic Field Theory	ES	3-0-0	3
4.		Electrical Circuit Analysis-II	PC	3-0-0	3
5.		DC Machines & Transformers	PC	3-0-0	3
6.		Electrical Circuit Analysis-II Lab	PC	0-0-3	1.5
7.		DC Machines & Transformers Lab	BS&H	0-0-3	1.5
8.		Data Structures	SC	0-1-2	2
				Total	**20**

Category	**CREDITS**
Engineering Science Courses	3
Basic Science and Humanities	6
Professional Core	9
Skill Course	2
TOTAL CREDITS	**20**

Sri Krishnadevaraya University College of Engineering & Technology
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Electrical & Electronics Engineering

Course Code	COMPLEX VARIABLES AND NUMERICAL METHODS	L	T	P	C
		3	0	0	3

II Year 1st Semester

Course Objectives:

- Understand the basics of complex function differentiation and analytic function construction.
- Apply Cauchy's theorems and residue techniques to solve contour integrals.
- Use numerical methods to solve algebraic and transcendental equations.
- Apply interpolation and numerical techniques to solve ordinary differential equations.

Course Outcomes (CO):

- Analyze the limits, continuity, and differentiation of functions of complex variables.
- Understand Cauchy-Riemann equations, analytic functions, and their properties.
- Apply Cauchy's theorem and Cauchy integral formulas to evaluate complex contour integrals.
- Classify singularities and poles, find residues, and evaluate complex integrals using the residue theorem.
- Apply numerical methods to solve algebraic and transcendental equations.
- Derive interpolating polynomials using interpolation formulas.
- Solve differential and integral equations numerically.

UNIT - I	**Complex Variable – Differentiation**	

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method.

UNIT II	**Complex Variable – Integration**	

Line integral-Contour integration, Cauchy's integral theorem(Simple Case), Cauchy Integral formula, Power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.

UNIT - III	**Solution of Algebraic & Transcendental Equations**	

Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method System of Algebraic equations: Gauss Elimination, Jacoby and Gauss Siedal method.

UNIT - IV	**Interpolation**	

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least squares.

UNIT - V	**Solution of Initial value problems to Ordinary differential equations**	

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's and modified Euler's methods-Runge-Kutta methods (second and fourth order).

Textbooks:
1. B.S.Grewal,HigherEngineeringMathematics, KhannaPublishers,2017, 44th Edition 2. S S Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.
Reference Books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10th Edition. 2. B.V.Ramana, Higher Engineering Mathematics, by Mc Graw Hill publishers 3. R.K.Jainand S.R.K. Iyengar, AdvancedEngineeringMathematics,AlphaScienceInternationalLtd.,2021 5th Edition(9th reprint). **Online Learning Resources:** 1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview 2. https://onlinecourses.nptel.ac.in/noc20_ma50/preview 3. http://nptel.ac.in/courses/111105090

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical & Electronics Engineering

Course Code	UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	L	T	P	C
		2	1	0	3

II Year 1st Semester

Course Objectives:

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutuallyenriching interaction with Nature.

Course Outcomes (CO):

- Define the terms like Natural Acceptance, Happiness and Prosperity
- Identify oneself, and one's surroundings (family, society nature)
- Apply what they have learnt to their own self in different day-to-day settings in real life
- Relate human values with human relationship and human society.
- Justify the need for universal human values and harmonious existence
- Develop as socially and ecologically responsible engineers

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1 - hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT - I

Introduction to Value Education (6 lectures and 3 tutorials for practice session)
Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture 4: Continuous Happiness and Prosperity – the Basic Human. Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance.

UNIT II

Harmony in the Human Being (6 lectures and 3 tutorials for practice session)
Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT - III		

Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture 16: Other Feelings, Justice in Human-to-Human Relationship Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT - IV		

Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT - V		

Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education PS1 Sharing about Oneself
PS2 Exploring Human Consciousness PS3 Exploring Natural Acceptance
Practice Sessions for UNIT II – Harmony in the Human Being PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self PS6 Exploring Harmony of self with the body
Practice Sessions for UNIT III – Harmony in the Family and Society PS7 Exploring the Feeling of

Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal
Practice Sessions for UNIT IV – Harmony in the Nature (Existence) PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence
Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

Textbook READINGS:
Textbook and Teachers Manual

a. The Textbook
R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics,2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
b. The Teacher's Manual
R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values andProfessional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elementsto help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.
Scenarios may be used to initiate discussion. The student is encouraged to take up" ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based onbasic human values. It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department. Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program onUniversal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3- S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview.

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical & Electronics Engineering

Course Code	ELECTROMAGNETIC FIELD THEORY	L	T	P	C
		3	0	0	3

II Year 1st Semester

Course Objectives:

- introduce vector analysis and its application in electrostatics, magnetostatics, and electromagnetic fields.
- Explain the behaviour of conductors, dielectrics, and capacitance in electric and magnetic fields.
- Teach the fundamental laws governing magnetostatics and electromagnetic induction.
- Introduce Maxwell's equations and their role in time-varying electromagnetic fields.

Course Outcomes (CO):

- Apply vector calculus techniques to solve problems related to electrostatics, including electric fields, potentials, and flux.
- Analyze the behaviour of conductors, dielectrics, and capacitance in electric fields and solve related practical problems.
- Apply the principles of magnetostatics to calculate magnetic forces, flux density, and inductance in current-carrying conductors.
- Understand and apply Maxwell's equations to analyze electromagnetic induction and time-varying electromagnetic fields.

UNIT I

Vector Analysis:

Vector Algebra: Scalars and Vectors, Unit vector, Vector addition and subtraction, Position and distance vectors, Vector multiplication, Components of a vector.

Coordinate Systems: Rectangular, Cylindrical and Spherical coordinate systems.

Vector Calculus: Differential length, Area and Volume. Del operator, Gradient of a scalar, Divergence of a vector and Divergence theorem (definition only). Curl of a vector and Stoke's theorem (definition only), Laplacian of a scalar

Electrostatics:

Coulomb's law and Electric field intensity (EFI) – EFI due to Continuous charge distributions (line and surface charge), Electric flux density, Gauss's law (Maxwell's first equation, $\nabla.\vec{D} = \rho_v$), Applications of Gauss's law, Electric Potential, Work done in moving a point charge in an electrostatic field (second Maxwell's equation for static electric fields, $\nabla \times \vec{E} = 0$), Potential gradient, Laplace's and Poison's equations..

UNIT II

Conductors-Dielectrics and Capacitance

Behaviour of conductor in Electric field, Electric dipole and dipole moment – Potential and EFI due to an electric dipole, Torque on an Electric dipole placed in an electric field, Current density-conduction and convection current densities, Ohm's law in point form, Behavior of conductors in an electric field, Polarization, dielectric constant and strength, Continuity equation and relaxation time, Boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space, Capacitance of parallel plate, coaxial and spherical capacitors, Energy stored and density in a static electric field, Coupled and decoupled capacitors.

UNIT - III

Magneto statics, Ampere's Law and Force in magnetic fields:

Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Magnetic flux density and Maxwell's second Equation ($\nabla.\vec{B} = 0$), Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation ($\nabla \times \vec{H} = \vec{J}$).

Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors, Magnetic dipole, Magnetic torque, and moment.

UNIT IV

Self and mutual inductance:

Self and mutual inductance – determination of self-inductance of a solenoid, toroid, coaxial cable and mutual inductance between a straight long wire and a square loop wire in the same plane – Energy stored and energy density in a magnetic field.

UNIT V

Faraday's laws of electromagnetic induction, Maxwell's fourth equation $\left(\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}\right)$, integral and point forms of Maxwell's equations, statically and dynamically induced EMF, Displacement current, Modification of Maxwell's equations for time varying fields, Poynting theorem and Poynting vector.

Textbooks:

1. "Elements of Electromagnetics" by Matthew N O Sadiku, Oxford Publications, 7th edition, 2018.
2. "Engineering Electromagnetics" by William H. Hayt& John. A. Buck Mc. Graw-Hill, 7th Editon.2006.

Reference Books:

1. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt. Ltd, 2nd edition.
2. "Electromagnetic Field Theory" by Yaduvir Singh, Pearson India, 1st edition, 2011.
3. "Fundamentals of Engineering Electromagnetics" by Sunil Bhooshan, Oxford University
4. Schaum's Outline of Electromagneticsby Joseph A. Edminister, MahamoodNavi, 4th Edition,2014.

Web Resources:

1. https://archive.nptel.ac.in/courses/108/106/108106073/
2. https://nptel.ac.in/courses/117103065

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	ELECTRICAL CIRCUIT ANALYSIS-II	L	T	P	C
		3	0	0	3

II Year 1st Semester

Course Objectives:

- Analyze balanced three-phase circuits and measure power.
- Apply Fourier series to periodic waveforms and analyze harmonics.
- Conduct transient analysis of R-L, R-C, and R-L-C circuits.
- Understand and convert network parameters for two-port networks.

Course Outcomes (CO):

- Course Outcomes:
- Calculate power in balanced three-phase circuits.
- Evaluate Fourier coefficients for non-sinusoidal waveforms.
- Solve transient responses using differential equations and Laplace transforms.
- Analyze two-port networks using different parameter forms.

UNIT - I

Analysis of three phase balanced circuits:

Phase sequence, star and delta connection of sources and loads, relation between line and phase quantities, analysis of balanced three phase circuits, measurement of active and reactive power.

Analysis of three phase unbalanced circuits:

Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power.

UNIT II

Analysis of Electric Circuits with Periodic Excitation: Fourier series and evaluation of Fourier coefficients, Trigonometric and complex Fourier series for periodic waveforms, Application to Electrical Systems – Effective value and average value of non-sinusoidal periodic waveforms, power factor, effect of harmonics

UNIT - III

Transient Analysis: Transient response of R-L, R-C and R-L-C circuits (Series and parallel combinations) for D.C. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform approach.

Laplace transforms – Definition and Laplace transforms of standard functions– Shifting theorem – Transforms of derivatives and integrals, Inverse Laplace transforms and applications.

UNIT - IV

Network Parameters: Impedance parameters, Admittance parameters, Hybrid parameters, Transmission (ABCD) parameters, conversion of Parameters from one form to other, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations- problems.

UNIT - V

NETWORKTOPOLOGY: -Definitions–Graph-Tree, Basic cut set and basic Tie set matrices for planar networks. Duality and dual Networks.

Textbooks:

1. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, 8th Edition McGraw-Hill, 2013
2. Fundamentals of Electric Circuits, Charles K. Alexander, Mathew N. O. Sadiku, 3rd Edition, Tata McGraw-Hill, 2019

Reference Books:

1. Network Analysis, M. E. Van Valkenburg, 3rd Edition, PHI, 2019.
2. Network Theory, N. C. Jagan and C. Lakshminarayana, 1st Edition, B. S. Publications, 2012.
3. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyam Mohan S. Palli, 5th Edition, Tata McGraw-Hill, 2017.
4. Engineering Network Analysis and Filter Design (Including Synthesis of One Port Networks)- Durgesh C. KulshreshthaGopal G. Bhise, Prem R. Chadha ,Umesh Publications 2012.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, DhanpatRai& Co., 2018, 7th Revised Edition.

Web Resources:

1. https://archive.nptel.ac.in/courses/117/106/117106108/
2. https://archive.nptel.ac.in/courses/108/105/108105159/

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical & Electronics Engineering

Course Code	DC MACHINES & TRANSFORMERS	L	T	P	C
		3	0	0	3

II Year 1st Semester

Course Objectives:

- Understand the construction and operation of DC generators and motors.
- Analyze performance characteristics and applications of DC machines.
- Explore speed control methods for DC machines and conduct testing techniques.
- Examine the principles and operation of single-phase transformers and their efficiency.

Course Outcomes (CO):

- Calculate EMF and load characteristics of various types of DC generators.
- Derive torque equations and analyze the performance of DC motors.
- Perform speed control and various tests on DC machines.
- Conduct open circuit and short circuit tests on transformers and analyze their efficiency.

UNIT - I

DC Generators:

Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques– Armature reaction and commutation - Methods of improving commutation - OCC and load characteristics of different types of generators – Parallel operation of DC Generators - Applications of DC Generators.

UNIT II

DC Motors:

DC motor – Back-emf - Generation of torque - Torque equation - Performance characteristics of different types of motors – Necessity of starters- 3-point and 4-point starters - Losses in DC machines- Applications of DC Motors numerical problems.

UNIT - III

Speed Control and Testing of DC Machines:

Speed control of DC Machines: Armature control and Flux control methods

Testing of DC machines: Brake test - Swinburne's test - Hopkinson's test - Fields test, Retardation test.

UNIT - IV

Single-phase Transformers:

Introduction to single-phase Transformers (Construction and principle of operation)–emf equation – operation on no-load and on load –lagging, leading and unity power factors loads –phasor diagrams– equivalent circuit –regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency, Applications.

UNIT - V

Testing of Transformers:

Open Circuit and Short Circuit tests – Sumpner's test – separation of losses— Parallel operation with equal and unequal voltage ratios– auto transformer – equivalent circuit – comparison with two winding transformers - Scott connection- off load and on load tap changers.

Textbooks:

1. Electrical Machinery by Dr. P S Bimbhra, 7th edition, Khanna Publishers, New Delhi,1995.
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002.

Reference Books:

1. Electrical Machines by D. P.Kothari, I .J .Nagarth, McGraw Hill Publications, 5th edition
2. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2011.
3. Generalized Theory of Electrical Machines by Dr. P S Bimbhra, 7th Edition, Khanna Publishers, 2021.
4. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons,2007.
5. Electric Machinery by Fitzgerald, A.E.,Kingsley, Jr.,C.,&Umans, S. D, 7th edition, McGraw-Hill Education, 2014.

Web Resources:

1. nptel.ac.in/courses/108/105/108105112
2. nptel.ac.in/courses/108/105/108105155

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical & Electronics Engineering

Course Code	ELECTRICAL CIRCUIT ANALYSIS-II LAB	L	T	P	C
		0	0	3	1.5

II Year 1st Semester

Course Objectives:

- Understand the principles of power measurement in balanced and unbalanced loads.
- Analyze and apply network parameters (Z, Y, ABCD, and Hybrid) for circuit evaluation.
- Explore transient responses in RL, RC, and RLC circuits.
- Study frequency responses of filters (low-pass, high-pass, band-pass, and band-stop).

Course Outcomes (CO):

- Measure and analyze active and reactive power in different load conditions.
- Determine and interpret various network parameters in electrical circuits.
- Evaluate transient responses in series and parallel RLC circuits.
- Analyze the frequency response of different types of filters.

LIST OF EXPERIMENTS:

Any 10 of the following experiments are to be conducted:

1. Measurement of Active Power and Reactive Power for Balanced loads.
2. Measurement of Active Power and Reactive Power for Unbalanced loads
3. Determination of Z and Y parameters.
4. Determination of ABCD and Hybrid parameters.
5. Series and Parallel connection of two port networks.
6. Cascaded connection of two port networks.
7. Transient Response of RL series circuits.
8. Transient Response of RC series circuits.
9. Transient Response of RLC Series & Parallel circuits.
10. Frequency response of Low Pass Filter.
11. Frequency response of High Pass Filter.
12. Frequency response of Band Pass Filter.
13. Frequency response of Band Stop Filter.

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical & Electronics Engineering

Course Code	DC MACHINES & TRANSFORMERS LAB	L	T	P	C
		0	0	3	1.5

II Year 1st Semester

Course Objectives:

- Control the speed of DC shunt motors through field current and armature voltage adjustments.
- Analyze the performance characteristics of DC machines and transformers through various testing methods.
- Evaluate the efficiency of DC generators and motors using load tests.
- Understand the principles of transformer testing, including open circuit and short circuit tests.

Course Outcomes (CO):

- Successfully adjust the speed of a DC shunt motor and interpret performance curves.
- Conduct tests to determine the efficiency of DC machines.
- Execute load tests on DC generators to evaluate their characteristics.
- Perform transformer tests, including OC and SC tests, to assess their performance and efficiency.

List of Experiments:

Any 10 of the following experiments are to be conducted:

1. Speed control of DC shunt motor by Field Current and Armature Voltage Control.
2. Brake test on DC shunt motor- Determination of performance curves.
3. Swinburne's test - Predetermination of efficiencies as DC Generator and Motor.
4. Hopkinson's test on DC shunt Machines.
5. Load test on DC compound generator-Determination of characteristics.
6. Load test on DC shunt generator-Determination of characteristics.
7. Fields test on DC series machines-Determination of efficiency.
8. Brake test on DC compound motor-Determination of performance curves.
9. OC & SC tests on single phase transformer.
10. Sumpner's test on single phase transformer.
11. Scott connection of transformers.
12. Parallel operation of Single-phase Transformers.
13. Separation of core losses of a single-phase transformer.

Reference:

1. https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical & Electronics Engineering

Course Code	DATA STRUCTURES	L	T	P	C
		0	1	2	2

II Year 1st Semester

Course Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

Course Outcomes (CO):

CO1: Identify the role of data structures in organizing and accessing data.
CO2: Design, implement, and apply linked lists for dynamic data storage.
CO3: Develop applications using stacks and queues.
CO4: Design and implement algorithms for operations on binary trees and binary search trees.
CO5: Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.

UNTI-I:

Introduction to Data Structures: Definition and importance of Data structures, Abstract data types (ADTs) and its specifications, **Arrays**: Introduction, 1-D, 2-D Arrays, accessing elements of array, Row Major and Column Major storage of Arrays, **Searching Techniques**: Linear & Binary Search, **Sorting Techniques**: Bubble sort, Selection sort, Quick sort.

Sample experiments:

1. Program to find min & max element in an array.
2. Program to implement matrix multiplication.
3. Find an element in given list of sorted elements in an array using Binary search.
4. Implement Selection and Quick sort techniques.

UNIT II

Linked Lists: Singly linked lists: representation and operations, doubly linked lists andcircular linked lists, Comparing arrays and linked lists, Applications of linked lists.

Sample experiments:

1. Write a program to implement the following operations.
   a. Insert b. Deletion c. Traversal
2. Write a program to store name, roll no, and marks of students in a class using circulardouble linked list.
3. Write a program to perform addition of given two polynomial expressions using linked list.

UNIT III

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing listetc.

Sample experiments:

1. Implement stack operations using

a. Arrays b. Linked list
2. Convert given infix expression into post fix expression using stacks.
3. Evaluate given post fix expression using stack.
4. Write a program to reverse given linked list using stack.

UNIT IV

Queues: Introduction to queues: properties and operations, Circular queues, implementing queues using arrays and linked lists, Applications of queues scheduling, etc.
Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.
Sample experiments:

1. Implement Queue operations using
   a. Arrays b. Linked list
2. Implement Circular Queue using
   a. Arrays b. Linked list
3. Implement Dequeue using linked list.

UNIT V

Trees: Introduction to Trees, Binary trees and traversals, Binary Search Tree – Insertion, Deletion & Traversal
Sample experiments:

1. Implement binary tree traversals using linked list.
2. Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations.

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders.
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E.Hopcroft.
3. Problem Solving with Algorithms and Data Structures by Brad Miller and David Ranum.
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein.
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick.

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical & Electronics Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
II Year II Semester					
S. No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Managerial Economics & Financial Analysis	MG	2-0-0	2
2.		Analog Circuits	ES	3-0-0	3
3.		Power Systems-I	PC	3-0-0	3
4.		Induction and Synchronous Machines	PC	3-0-0	3
5.		Control Systems	PC	3-0-0	3
6.		Induction and Synchronous Machines Lab	PC	0-0-3	1.5
7.		Control Systems Lab	PC	0-0-3	1.5
8.		Soft Skills	SC	0-1-2	2
9.		Design Thinking and Innovation	BS&H	0-1-2	2
10.		Environmental Science	MC	2-0-0	-
				Total	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation					

Category	**Credits**
Basic Sciences and Humanities course	2
Engineering Science Courses	3
Management Course	2
Skill Course	2
Professional Core Courses	12
TOTAL CREDITS	**21**

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical & Electronics Engineering

Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	L	T	P	C
		2	0	0	2

II Year 2nd Semester

Course Objectives:

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes (CO):

- Define the concepts related to Managerial Economics, financial accounting and management
- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
- Apply the Concept of Production cost and revenues for effective Business decision
- Analyze how to invest their capital and maximize returns
- Evaluate the capital budgeting techniques.
- Develop the accounting statements and evaluate the financial performance of business entity .

UNIT - I **Managerial Economics and Demand analysis**

Introduction- Nature and Scope of Managerial Economics. Demand-Concept- Demand Function- Law of Demand and its Exceptions. Demand Elasticity- Types of Elasticity – Measurement- Significance of elasticity. Demand Forecasting-Factors governing Forecasting- Methods of Demand Forecasting.

UNIT - II **Production and Cost Analysis**

Introduction –Production Function– Short run and long run Production Function- Isoquants and Isocosts, Least-Cost Combination. Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems) –Significance of BEA.

UNIT - III **Business Organizations and Markets**

Introduction – Forms of Business Organizations- Sole Proprietorship - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition: Features of Perfect Competition-Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT - IV **Capital and Capital Budgeting**

Introduction – Capital and its Significance- Types of Capital- Estimating Fixed and Working capital requirements- Sources of Short-term and Long-term Capital. Capital Budgeting– Features of capital budgeting Proposals, Methods and Evaluation of Projects – Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV) and Internal Rate Return (IRR) Method (sample problems)

UNIT-V Financial Accounting and Analysis

Introduction - Double-Entry Bookkeeping- preparation of Journal- Ledger -Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, Capital structure Ratios and Profitability Ratios

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International. 3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage

. **Online Learning Resources:**

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting.

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical & Electronics Engineering

Course Code	ANALOG CIRCUITS	L	T	P	C
		3	0	0	3

II Year 2nd Semester

Course Objectives:

- Understand DC biasing techniques for BJTs to ensure operational stability.
- Analyze small signal models of BJTs in different amplifier configurations.
- Explore feedback amplifiers and the impact of negative feedback on performance.
- Learn about operational amplifiers and their applications in various circuits

Course Outcomes (CO):

- Apply DC biasing methods to design stable transistor circuits.
- Analyze and model transistor amplifiers for performance evaluation.
- Design feedback amplifiers demonstrating an understanding of their characteristics.
- Utilize operational amplifiers in applications such as signal processing and conversion

UNIT - I

DC biasing of BJTs: Load lines, Operating Point, Bias Stability, Collector-to-Base Bias, Self-Bias, Stabilization against Variations in V_{BE} and β for the Self-Bias Circuit, Bias Compensation, Thermal Runaway, Thermal Stability.

Small Signals Modeling of BJT: Analysis of a Transistor Amplifier Circuit using h-parameters, Simplified CE Hybrid Model, Analysis of CE, CC, CB Configuration using Approximate Model, Frequency Response of CE and CC amplifiers.

UNIT - II

Feedback Amplifiers: Classification of Amplifiers, the Feedback Concept, General Characteristics of Negative-Feedback Amplifiers, Effect of Negative Feedback upon Output and Input Resistances, Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback.

Oscillator Circuits: Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift oscillator, Wien bridge Oscillator, Crystal Oscillator.

UNIT - III

Operational Amplifiers: Introduction, Basic information of Op-Amp, Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp, OP-Amps Characteristics: Introduction, DC and AC characteristics, 741 op-amp & its features.

Operation Amplifier Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator.

UNIT - IV

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.

Timers and Phase Locked Loop: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, PLL block schematic, principles and description of individual blocks, 565 PLL, Applications of VCO (566).

UNIT-V

Digital To Analog and Analog To Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

Textbooks:

1. Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition, 2010.
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.

Reference Books:

1. Electronic Devices and Circuit Theory – Robert L.Boylestad and Lowis Nashelsky, Pearson Edition, 2021.
2. Electronic Devices and Circuits–G.K. Mithal, Khanna Publisher, 23rd Edition, 2017.
3. Electronic Devices and Circuits – David Bell, Oxford, 5thEdition, 2008.
4. Electronic Principles–Malvino, Albert Paul, and David J. Bates, McGraw-Hill/Higher Education, 2007.
5. Operational Amplifiers and Linear Integrated Circuits– Gayakwad R.A, Prentice Hall India, 2002.
6. Operational Amplifiers and Linear Integrated Circuits –Sanjay Sharma, Kataria & Sons, 2nd Edition, 2010.
7. Design of Analog CMOS Integrated Circuits - Behzad Razavi

Web Resources:

1. https://nptel.ac.in/courses/122106025.
2. https://nptel.ac.in/courses/108102112.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	POWER SYSTEMS-I	L	T	P	C
		3	0	0	3

II Year 2nd Semester

Course Objectives:

- Understand the layout and operation of hydroelectric and thermal power stations.
- Learn about the components and principles of nuclear power plants.
- Analyze the design and function of air-insulated and gas-insulated substations.
- Examine the economic aspects and tariff structures in power distribution.

Course Outcomes (CO):

- Describe major components and operational principles of various power plants.
- Identify and explain the functions of nuclear reactor components and safety measures.
- Design simple layouts for substations and differentiate between air-insulated and gas-insulated types.
- Evaluate economic factors and tariff methods related to power generation and distribution.

UNIT - I

Hydroelectric Power Stations:

Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation

Thermal Power Stations:

Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

UNIT - II

Nuclear Power Stations:

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

UNIT - III

Substations:**Air Insulated Substations** – indoor & outdoor substations, substations layouts of 33/11 kV 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, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, constructional aspects of GIS, comparison of air insulated substations and gas insulated substations.

UNIT - IV

Distribution Systems:

lassification of Distribution systems, A.C Distribution, overhead versus Underground system, Connection chemes of Distribution system, Requirements of Distribution system, Design considerations in Distribution ystem.

Underground Cables:

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables. Grading of cables: capacitance grading and intersheath grading.

UNIT-V

conomic Aspects & Tariff:

Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants.

Tariff Methods– Costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods, Time of Day (ToD) tariff and Time of Use (ToU) tariff.

Textbooks:

1. S. N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition, 2010
2. J. B. Gupta, Transmission and Distribution of Electrical Power, S. K. Kataria and sons,10th Edition, 2012

Reference Books:

1. I.J. Nagarath & D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019.
2. C.L.Wadhwa,Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018.
3. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 4th Edition, 2005.
4. Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill, 1985.
5. Handbook of switchgear, BHEL, McGraw-Hill Education, 2007.

Web Resources:

1. https://nptel.ac.in/courses/108102047

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code		L	T	P	C
	INDUCTION AND SYNCHRONOUS MACHINES	**3**	**0**	**0**	**3**

II Year 2nd Semester

Course Objectives:

- Understand the construction and operation of 3-phase induction motors and their applications.
- Analyze the performance characteristics of 3-phase induction motors and methods for speed control.
- Learn the principles and construction features of synchronous generators and motors.
- Explore the principles of operation and applications of special machines such as single-phase induction motors, reluctance motors, stepper motors, and BLDC motors.

Course Outcomes (CO):

- Describe the components and operation of squirrel cage and slip ring induction motors.
- Calculate torque characteristics and analyze starting methods for induction motors.
- Explain the voltage regulation methods for synchronous generators and their synchronization techniques.
- Identify the operating principles and applications of various special machines.

UNIT - I

3-phase induction motors:
Construction of Squirrel cage and Slipring induction motors– production of rotating magnetic field – principle of operation – rotor emf and rotor frequency – rotor current and power factor at standstill and during running conditions– rotor power input, rotor copper loss and mechanical power developed and their inter-relationship –equivalent circuit – phasor diagram, Applications.

UNIT - II

Performance of 3-Phase induction motors:
Torque equation – expressions for maximum torque and starting torque – torque-slip characteristics – double cage and deep bar rotors –No load, Brake test and Blocked rotor tests – circle diagram for predetermination of performance- methods of starting –starting current and torque calculations -speed control of induction motor with V/f control method, rotor resistance control and rotor emf injection technique –crawling and cogging – induction generator operation.

UNIT - III

Synchronous Generator:
Constructional features of non-salient and salient pole type alternators- armature windings – distributed and concentrated windings – distribution& pitch factors – E.M.F equation –armature reaction – voltage regulation by synchronous impedance method – MMF method and Potier triangle method –two reaction analysis of salient pole machines -methods of synchronization- Slip test – Parallel operation of alternators.

UNIT - IV

Synchronous Motor:
Synchronous motor principle and theory of operation – Effect of excitation on current and power factor– synchronous condenser –expression for power developed –hunting and its suppression – methods of starting, Applications.

UNIT-V

Special Machines:
Single phase induction motors – constructional features – equivalent circuit- starting methods- Principle of operation of Shaded pole motor.
Principle of operation of reluctance motor, stepper motor, BLDC motor and universal motor- Applications.

Textbooks:

1. Electrical Machinery, Dr. P.S. Bhimbra, Khanna Publishing, 2021,First Edition.
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002.

Reference Books:

1. Electrical machines, D.P. Kothari and I.J. Nagrath, McGraw Hill Education, 2017, Fifth Edition.
2. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria & Sons,2007.
3. Electric Machinery, A.E.Fitzgerald, Charles kingsley, Stephen D.Umans, McGraw-Hill, 2020, Seventh edition.

Web Resources:

1. https://nptel.ac.in/courses/108/105/108105131
2. https://nptel.ac.in/courses/108106072

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

II Year 2nd Semester

Course Objectives:

- Understand the concepts of open loop and closed loop control systems, including their classification and characteristics.
- Analyze time response and steady-state performance of control systems, focusing on first and second-order systems.
- Evaluate system stability using time-domain methods and root locus techniques.
- Apply frequency response analysis techniques to assess stability and design compensators in control systems.

Course Outcomes (CO):

- Differentiate between open loop and closed loop control systems, providing examples.
- Calculate time response specifications and steady-state errors for first and second-order systems.
- Apply Routh's stability criterion and construct root loci to analyze system stability.
- Design compensators in the frequency domain and understand state space analysis of continuous systems.

UNIT - I

CONTROL SYSTEMS CONCEPTS

Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Principle of operation of DC and AC Servo motor, Transfer function of DC servo motor - AC servo motor, Synchros.

UNIT - II

TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants, P, PI, PID Controllers.

UNIT - III

STABILITY ANALYSIS IN TIME DOMAIN

The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT - IV

FREQUENCY RESPONSE ANALYSIS

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

Compensation techniques – Lag, Lead, Lag-Lead Compensator design in frequency Domain.

UNIT-V

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, state models - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability, Duality between controllability and observability. Pole placement design using state feedback.

Textbooks:

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.

Reference Books:

1. Control Systems Principles & Design by M.Gopal, 4th Edition, Mc Graw Hill Education, 2012.
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 8th edition, 2003.
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
4. Control System Design by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
5. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell and Abbas Emami-Naeini, 6th Edition, Pearson, 2010.

Web Resources:

1. https://nptel.ac.in/courses/108102043
2. https://nptel.ac.in/courses/108106098.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical and Electronics Engineering

Course Code	INDUCTION AND SYNCHRONOUS MACHINES LAB	L	T	P	C
		0	0	3	1.5

II Year 2nd Semester

Course Objectives:

- Understand the performance characteristics of three-phase and single-phase induction motors.
- Analyze different methods for speed control and efficiency improvement of induction motors.
- Study the regulation techniques of alternators using various methods.
- Conduct experiments to assess the parallel operation and efficiency of alternators and motors

Course Outcomes (CO):

- Ability to perform brake tests on induction motors to determine efficiency and performance.
- Capability to use circle diagrams for analyzing the characteristics of induction motors.
- Proficiency in regulating alternators using synchronous impedance, MMF, and Potier methods.
- Competence in improving power factor and efficiency of single-phase motors using capacitors.

List of Experiments:

Any 10 experiments of the following are required to be conducted

1. Brake test on three phase Induction Motor.
2. Circle diagram of three phase induction motor.
3. Speed control of three phase induction motor by V/f method.
4. Equivalent circuit of single-phase induction motor.
5. Power factor improvement of single-phase induction motor by using capacitors.
6. Load test on single phase induction motor.
7. Regulation of a three -phase alternator by synchronous impedance &MMF methods.
8. Regulation of three-phase alternator by Potier triangle method.
9. V and Inverted V curves of a three-phase synchronous motor.
10. Determination of X_d, X_q& Regulation of a salient pole synchronous generator.
11. Determination of efficiency of three phase alternator by loading with three phase induction motor.
12. Parallel operation of three-phase alternator under no-load and load conditions.
13. Determination of efficiency of a single-phase AC series Motor by conducting Brake test.

Reference:

1. https://em-coep.vlabs.ac.in/List%20of%20experiments.html

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	CONTROL SYSTEMS LAB	L	T	P	C
		0	0	3	1.5

II Year 2nd Semester

Course Objectives:

- Understand the fundamental principles of control systems and their components.
- Analyze the performance and stability of control systems in time and frequency domains.
- Explore the role of PID controllers and compensation techniques in improving system response.
- Gain practical experience with programmable logic controllers and feedback systems.

Course Outcomes (CO):

- Ability to model and analyze control systems using differential equations and transfer functions.
- Proficiency in designing and tuning PID controllers for real-world applications.
- Capability to evaluate system stability using Root Locus, Bode, and Nyquist plots.
- Understanding of the principles and characteristics of servo motors, synchros, and magnetic amplifiers

List of Experiments:

Any 10 experiments of the following are required to be conducted

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.
4. Effect of feedback on DC servo motor
5. Transfer function of DC Machine
6. Effect of P, PD, PI, PID Controller on a second order system
7. Lag and lead compensation – Magnitude and phase plot
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Verification of system stability using Root locus, Bode Plot & Nyquist Plot
12. Verification of time response analysis for a given system
13. Verification of controllability and observability for a given system.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical and Electronics Engineering

Course Code	SOFT SKILLS	L	T	P	C
		0	1	2	2

II Year 2nd Semester

Course Objectives:

- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To enhance healthy relationship and understanding within and outside an organization
- To function effectively with heterogeneous teams

Course Outcomes (CO):

- List out various elements of soft skills
- Describe methods for building professional image
- Apply critical thinking skills in problem solving
- Analyze the needs of an individual and team for well-being
- Assess the situation and take necessary decisions
- Create a productive workplace atmosphere using social and work-life skills ensuring personal and emotional well-being

UNIT - I **Soft Skills & Communication Skills**

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills -Significance, process, types - Barriers of communication - Improving techniques.

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity.

(The facilitator can guide the participants before the activity citing examples from the lives ofthe great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation.

UNIT - II **Critical Thinking**

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT - III **Problem Solving & Decision Making**

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion

UNIT - IV **Emotional Intelligence & Stress Management**

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm,

gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates.

UNIT-V Corporate Etiquette

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette - Corporate grooming tips -Overcoming challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

NOTE-:

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

Textbooks:

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing forTomorrow, I K International Publishing House, 2018

Reference Books

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018.
2. Alex K, Soft Skills S.Chand & Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan & Sangeetha Sharma, Soft Skills: An Integrated Approachto Maximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Soft Skills for a Big Impact (English, Paperback, Renu Shorey) Publisher: Notion Press
6. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher : Vayu Education of India, 2014

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

Sri Krishnadevaraya University
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Electrical and Electronics Engineering

Course Code	DESIGN THINKING AND INNOVATION	L	T	P	C
		0	1	2	2

II Year 2nd Semester

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes (CO):

- Define the concepts related to design thinking.
- Explain the fundamentals of Design Thinking and innovation
- Apply the design thinking techniques for solving problems in various sectors.
- Analyse to work in a multidisciplinary environment
- Evaluate the value of creativity
- Formulate specific problem statements of real time issues

UNIT - I **Introduction to Design Thinking**

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, historyof Design Thinking, New materials in Industry.

UNIT - II **Design Thinking Process**

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development.

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III **Innovation**

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT - IV **Product Design**

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies.

Activity: Importance of modelling, how to set specifications, Explaining their own productdesign.

UNIT-V Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell,Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough.H, The Era of Open Innovation – 2013

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Electrical and Electronics Engineering

Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://swayam.gov.in/nd1_noc19_mg60/previ

Sri Krishnadevaraya University
College of Engineering & Technology,Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ENVIRONMENTAL SCIENCE	L	T	P	C
		2	0	0	0

II Year 2nd Semester

Course Objectives:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- To save earth from the inventions by the engineers.

Course Outcomes (CO):

- Analyze various energy sources and their environmental impacts.
- Understand ecosystem functions and propose biodiversity conservation strategies.
- Identify causes of pollution and recommend control measures.
- Evaluate climate change impacts and suggest mitigation strategies.
- Apply environmental management systems and sustainability practices.

UNIT - I

NATURAL RESOURCES:

Energy resources: Sources of energy and their classification, renewable and non-renewable sources of energy; Conventional energy sources, non-conventional energy sources; Implications of energy use on the environment.

Forest resources – Use and over – exploitation, deforestation, **Water resources** – Use and over utilization of surface and ground water–**Mineral resources**: Use and exploitation, environmental effects of extracting and using mineral resources

Introduction to sustainable development: Sustainable Development Goals (SDGs) - targets and indicators, challenges and strategies for SDGs.

UNIT - II

ECOSYSTEMS: Concept of an ecosystem, Structure and function of an ecosystem, Energy flow in the ecosystem, Ecological succession. Introduction, types, characteristic features, structure and function of Forest, Grassland, Desert and aquatic ecosystems.

BIODIVERSITY AND ITS CONSERVATION: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts

UNIT - III

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of Air, Water, Soil, Marine, Noise, Thermal and Nuclear Pollutions.

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution.

UNIT - IV

Climate Change: Impacts, Adaptation and Mitigation:

Understanding climate change: Natural variations in climate; Structure of atmosphere; **Anthropogenic climate change from greenhouse gas emissions**– past, present and future; Projections of global climate change

Impacts, vulnerability and adaptation to climate change. Observed impacts of climate change on ocean and land systems.

Mitigation of climate change: Green House Gas (GHG) reduction vs. sink enhancement; Concept of carbon intensity, energy intensity and carbon neutrality; Energy efficiency measures; Renewable energy sources; Carbon capture and storage.

UNIT-V

Sri Krishnadevaraya University
College of Engineering & Technology,Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Environmental Management

Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights; Introduction to environmental legislations on the forest, wildlife and pollution control.

Environmental management system: ISO 14001, Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis, Environmental audit and impact assessment; Environmental risk assessment Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Ecomark scheme.

TEXTBOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by PalaniSwamy – Pearson education
3. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

REFERENCES:

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies byJ.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Pubilishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited

Sri Krishnadevaraya University
College of Engineering & Technology,Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	COMMUNITY SERVICE PROJECT ……Experiential learning through community engagement				

II Year 2nd Semester

INTRODUCTION

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as asocially responsible institution.

OBJECTIVE

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.

- The Community Service Project should be different from the regular programs ofNSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project reports should be submitted by each student. An internal Viva shall alsobe conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on thejob training.

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
    - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
    - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
        - Agriculture
        - Health
        - Marketing and Cooperation
        - Animal Husbandry
        - Horticulture
        - Fisheries
        - Sericulture
        - Revenue and Survey
        - Natural Disaster Management
        - Irrigation
        - Law & Order
        - Excise and Prohibition
        - Mines and Geology
        - Energy
        - Internet
        - Free Electricity
        - Drinking Water

EXPECTED OUTCOMES
BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moraldevelopment
- Greater interpersonal development, particularly the ability to work well with

others,and build leadership and communication skills.

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greateropportunity.

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty andcommunity
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES ANDUNIVERSITIES

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICEPROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey

8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling lvel- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant

themes.Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social

EntrepreneurshipGeneral Camps

1. General Medical camps
2. Eye Camps

3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important

daysPrograms for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality

DevelopmentCommon
Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –

i. Agriculture
ii. Health
iii. Marketing and Cooperation
iv. Animal Husbandry
v. Horticulture
vi. Fisheries
vii. Sericulture
viii. Revenue and Survey
ix. Natural Disaster Management
x. Irrigation
xi. Law & Order
xii. Excise and Prohibition

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. Thestudents then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with theGovernmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project

ActivityDuration: 8 weeks

1. **Preliminary Survey (One Week)**
   - A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.

- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

2. Community Awareness Campaigns (One Week)

- Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. Community Immersion Programme (Three Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

4. Community Exit Report (One Week)

- During the last week of the Community Service Project, a detailed report of theoutcome of the 8 weeks' works to be drafted and a copy shall be submitted to thelocal administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated bythe mentor and suitable marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily logbook need to be maintained bythe students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit thestudents and guide them.

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
III Year 1 Semester					
S. No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Power Electronics	PC	3-0-0	3
2.		Digital Circuits	PC	3-0-0	3
3.		Power Systems-II	PC	3-0-0	3
4.		1. Signals and Systems 2. Computer Organization 3. Utilization of Electrical Energy	PE-I	3-0-0	3
5.		1. Electrical Safety Practices and Standards 2. Electrical Technology 3. FPGA Based Controller Design	OE-I	3-0-0	3
6.		Power Electronics Lab	PC	0-0-3	1.5
7.		Analog and Digital Circuits Lab	PC	0-0-3	1.5
8.		Circuit Simulation and Analysis using Pspice	SC	0-1-2	2
9.		Tinkering Lab	ES	0-0-2	1
10.		Evaluation of Community Service Project	-	-	2
				Total	**23**

Category	**Credits**
Open Elective Courses	3
Engineering Science Courses	1
Community Service Project	2
Skill Course	2
Professional Core Courses	12
Professional Elective Courses	3
TOTAL CREDITS	**23**

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	POWER ELECTRONICS	L	T	P	C
		3	0	0	3

III Year I Semester

Course Objectives

- Understand the fundamentals of power semiconductor devices and their switching characteristics for power conversion applications.
- Study the operation and analysis of basic power electronic converters such as rectifiers, choppers, inverters, and AC voltage controllers.
- Develop the ability to design and analyze converter circuits for various industrial, commercial, and domestic applications.
- Gain knowledge of control techniques for efficient conversion, regulation, and utilization of electric power.
- Explore the applications of power electronics in drives, renewable energy systems, and power supplies.
- Familiarize with protection, thermal management, and design considerations of power electronic systems.

Course Outcomes (CO):

- Understand the I-V Characteristics and Gate Drive Requirements of Power Devices Including Diodes, Thyristors, MOSFETs, and IGBTs.
- Design Single-Phase and Three-Phase Rectifiers with Different Load Conditions and Evaluate Power Factor and Source Inductance Effects.
- Apply Duty Ratio Control and Analyze Steady-State Waveforms of Buck, Boost, and Buck-Boost Converters.
- Analyze the Operation of Inverters, AC Voltage Controllers, and Cyclo Converters with Various Load Conditions and Commutation Techniques.
- Explore advanced power electronic devices like GaN and SiC, understanding their applications in modern power systems.

UNIT – I **POWER SWITCHING DEVICES**

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET, IGBT and GTO. Introduction to Galium Nitride and Silicon Carbide Devices.

UNIT – II **RECTIFIERS**

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape, power factor and effect of source inductance; Analysis of rectifiers with filter capacitance, Dual Converter -Numerical problems.

UNIT – III **DC-DC CONVERTERS**

Elementary chopper with an active switch and diode, concepts of duty ratio, control strategies and average output voltage: Power circuit, analysis and waveforms at steady state, duty ratio control and average output voltage of Buck, Boost and Buck- Boost Converters.

UNIT – IV **INVERTERS**

Single phase Voltage Source inverters – operating principle - steady state analysis, Simple forced commutation circuits for bridge inverters – Voltage control techniques for inverters and Pulse width modulation techniques, single phase current source inverter with ideal switches, basic series inverter, single phase parallel inverter – basic principle of operation only, Three phase bridge inverters (VSI) – 180 degree mode – 120 degree mode of operation - Numerical problems

UNIT – V **AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS**

AC voltage controllers – Principle of phase control – Principle of integral cycle control - Single phase two SCRs in anti-parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – RMS load voltage, current and power factor - wave forms – Numerical problems. Cyclo converters - Midpoint and Bridge connections - Single phase to single phase step-up and step-down cyclo converters with Resistive and inductive load, Principle of operation, Waveforms, output voltage equation.

Textbooks

1. M. H. Rashid, "Power Electronics: Circuits, Devices and Applications", 2nd edition, Prentice Hall of India, 1998.
2. P.S. Bimbhra, "Power Electronics", 4th Edition, Khanna Publishers, 2010.
3. M. D. Singh & K. B. Kanchandhani, "Power Electronics", Tata Mc Graw Hill Publishing Company, 1998.

Reference Books

1. Ned Mohan, "Power Electronics", Wiley, 2011.
2. Robert W. Erickson and Dragan Maksimovic, "Fundamentals of Power Electronics" 2nd Edition, Kluwer Academic Publishers, 2004.
3. Vedam Subramanyam, "Power Electronics", New Age International (P) Limited, 1996.
4. V. R. Murthy, "Power Electronics", 1st Edition, Oxford University Press, 2005.
5. P. C. Sen, "Power Electronics", Tata Mc Graw-Hill Education, 1987.
6. J. M. D. Murphy "Power Electronic Control of Alternating Current Motors".

Sri Krishnadevaraya University College of Engineering & Technology
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Electrical and Electronics Engineering

Course Code	DIGITAL CIRCUITS	L	T	P	C
		3	0	0	3

III Year I Semester

Course Objectives:

- To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
- To analyze combinational circuits like adders, subtractors, and code converters.
- To explore combinational logic circuits and their applications in digital design.
- To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.

To gain knowledge about programmable logic devices and digital IC's.

Course Outcomes (CO):

- . Learn Boolean algebra, logic simplification techniques, and combinational circuit design. L1
- Analyze combinational circuits like adders, subtractors, and code converters. L2
- Explore combinational logic circuits and their applications in digital design. L3
- Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.L1

Gain knowledge about programmable logic devices and digital IC's. L3

UNIT – I	LOGIC SIMPLIFICATION AND COMBINATIONAL LOGIC DESIGN

Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT – II	INTRODUCTION TO COMBINATIONAL DESIGN 1

Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT – III	COMBINATIONAL LOGIC DESIGN 2

Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT – IV	SEQUENTIAL LOGIC DESIGN

Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT – V	PROGRAMMABLE LOGIC DEVICES

ROM, Programmable Logic Devices (PLA and PAL).
Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

Textbooks

1. Digital Design, M.Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, Zvi Kohavi and Nirah K.Jha, 2nd Edition, Tata McGraw Hill, 2005.

Reference Books

1.Fundamentals of Logic Design, Charles H Roth,Jr., 5th Edition, Brooks/cole Cengage Learning, 2004

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	POWER SYSTEMS-II	L	T	P	C
		3	0	0	3

III Year I Semester

Course Objectives:

- To study about line parameters and constants
- To study the performance of transmission lines
- To know about overhead line insulators, corona, sag and tension in transmission lines
- To study about symmetrical components and different types of faults in power system.
- To understand the concept of voltage control, compensation methods

Course Outcomes (CO):

- Analyse the transmission lines and obtain the transmission line parameters and constants.
- Analyse transmission line performance
- Design transmission lines to meet the day to day power requirements.
- Apply load compensation techniques to control reactive power

UNIT – I **TRANSMISSION LINE PARAMETERS**

Types of Conductors - Calculation of Resistance for Solid Conductors, Bundle Conductors, Skin effect, Proximity effect, Concept of GMR & GMD- Transposition of Power lines- Calculation of inductance for single phase and three phase, Single and Double circuit lines, Symmetrical and asymmetrical conductor configurations with and without transposition. Calculation of Capacitance for 2 wire and 3 wire systems, effect of ground on Capacitance, Capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

UNIT – II **PERFORMANCE OF TRANSMISSION LINES**

Classification of Transmission Lines-Short, medium and long line and their models representation - Nominal-T, Nominal-π and A, B, C, D Constants for symmetrical networks, Numerical Problems and solutions for estimating regulation and efficiency of all types of lines. Ferranti effect and Charging Current

UNIT – III **OVERHEAD LINE INSULATORS**

Types of Insulators, String efficiency and Methods for improvement, – Voltage Distribution, Calculation of String efficiency, Capacitance Grading and Static Shielding., Numerical Problems

SAG AND TENSION: Sag and Tension Calculations with equal and unequal heights of towers, Effect of wind and ice on weight of conductor, Stringing chart, Sag template and its applications Numerical Problems.

UNIT – IV **CORONA**

Corona- factors affecting corona, critical voltages and Power loss due to Corona. Radio Interference

VOLTAGE CONTROL AND POWER FACTOR IMPROVEMENT:

Methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers, power factor improvement methods.

UNIT – V **COMPENSATION IN POWER SYSTEMS**

Concepts of Load compensation Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

Textbooks

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.
3. B.R.Gupta,"Power System Analysis and Design", S.ChandPublishing.1998.

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 Sadat, "Power System Analysis", Tata Mc Graw Hill Pub. Co. 2002.
4. W.D. Stevenson, "Elements of Power system Analysis", McGraw Hill International Student Edition.

Online Learning Resource

1. https://onlinecourses.nptel.ac.in/noc22_ee17/preview

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	SIGNALS AND SYSTEMS	L	T	P	C
	(Professional Elective -I)	3	0	0	3

III Year I Semester

Course Objectives:

- To understand the basic properties of signal & systems and LTI systems.
- To learn Fourier series representation of periodic signals.
- To study representation of signals in continuous and discrete time Fourier transform
- To analyze the sampling theorem and characterize signals & systems in time & frequency domain.
- To apply Laplace transform and Z transform to study about the stability of systems.

Course Outcomes (CO):

- Explain the basic properties of signal & systems and LTI systems. L2
- Apply Fourier series to represent periodic signals. L3
- Represent signals in continuous and discrete time Fourier transform. L2
- Analyze the sampling theorem and characterize signals & systems in time & frequency domain. L3
- Analyse the stability of systems by applying Laplace transform and Z transform . L3

UNIT – I	SIGNALS AND SYSTEMS

Continuous and Discrete Time Signals, Transformations of the Independent Variable, Elementary Signals-Unit Impulse, Unit Step Functions, Ramp Signal, Rectangular function, Signum Function, Sinc & Sa Function, Exponential and Sinusoidal Signals, Classification of Signals & Systems, Continuous and Discrete Time Systems, Basic System Properties, Linear Time Invariant (LTI) Systems, Discrete-Time LTI Systems, Convolution Sum, Continuous Time LTI Systems, Convolution Integral, Properties of LTI Systems, Causal LTI Systems described by Differential and Difference Equations, Singularity Functions.

UNIT – II	FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS

Response of LTI Systems to Complex Exponentials. Fourier Series Representation of Continuous Time Periodic Signals, Trigonometric, Polar, Exponential fourier Series & related problems, Convergence of the Fourier Series, Properties of Continuous Time Fourier Series, Fourier Series Representation of Discrete Time Periodic Signals, Properties of Discrete Time Fourier Series, Fourier Series and LTI Systems

UNIT – III	THE CONTINUOUS-TIME FOURIER TRANSFORM

Representation of aperiodic Signals, Continuous Time Fourier Transform, Fourier Transform for Periodic Signals, Properties of the Continuous Time Fourier Transform, Systems characterized by Linear constant coefficient differential equations, Discrete Time Fourier Transform - Representation of Aperiodic Signals, Discrete Time Fourier Transform, Frequency Response, Systems Characterized by Linear Constant-Coefficient Difference Equations.

UNIT – IV	TIME & FREQUENCY CHARACTERIZATION OF SIGNALS AND SYSTEMS

The Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency Response of LTI Systems, Time-Domain Properties of Ideal Frequency Selective Filters, Time Domain and Frequency Domain Aspects of Non-ideal Filters, Examples of Continuous time filters and Discrete time filters described by differential equations, First-Order and Second-Order Continuous and Discrete-Time Systems, Examples of Time and Frequency Domain Analysis of Systems,**Sampling**: Representation of a Continuous Time Signal by Its Samples, Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation, Effect of under sampling: Aliasing, Discrete Time Processing of Continuous-Time

UNIT – V	LAPLACE AND Z-TRANSFORMS

The Laplace Transform, Region of Convergence for Laplace Transforms, Inverse Laplace Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the Laplace Transform, Some Laplace Transform Pairs, Analysis and Characterization of LTI Systems Using the Laplace Transform,

System Function Algebra and Block Diagram Representations, Unilateral Laplace Transform, Z-Transform - Region of Convergence for the z-Transform, Inverse z-Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the z-Transform, Some Common z-Transform Pairs, Analysis and Characterization of LTI Systems Using z-Transforms, System Function Algebra and Block Diagram Representations, Unilateral z-Transforms.
Textbooks:
1 Signals and Systems, Alan V. Oppenheim, Alan S. Willsky, & S. Hamid, 2nd Edition, Pearson Higher Education, 1997. 2. Principles of Linear Systems and Signals, B.P. Lathi, 2nd Edition, Oxford University Press, 2011.
Reference Books
1 Signals & Systems, Simon Haykin and B. Van Veen, 2nd Edition, John Wiley, 2003. 2. Signals and systems, Narayana Iyer and K Satya Prasad, 1st Edition, CENGAGE Learning, 2011. 3. Signals, Systems and Transforms, C. L. Philips, J. M. Parr and Eve A. Riskin, 4th Edition, Pearson education, 2008.
Online Learning Resource

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	COMPUTER ORGANIZATION (Professional Elective Course-I)	L	T	P	C
		3	0	0	3

III Year 1st Semester

Course Objectives:

To make the student learn about

- To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design
- To understand the structure and behavior of various functional modules of a computer.
- To learn the techniques that computers use to communicate with I/O devices
- To acquire the concept of pipelining and exploitation of processing speed.
- To learn the basic characteristics of multiprocessors

Course Outcomes(CO):

CO1: Understand computer architecture concepts related to the design of modern processors, memories and I/Os

CO2: Identify the hardware requirements for cache memory and virtual memory

CO3: Design algorithms to exploit pipelining and multiprocessors

CO4: Understand the importance and trade-offs of different types of memories

CO5: Identify pipeline hazards and possible solutions to those hazards

UNIT-I	**Basic Structure of Computer, Machine Instructions and Programs**

Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer. Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines, Additional Instructions.

UNIT-II	**Arithmetic, Basic Processing Unit**

Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, FloatingPoint Numbers and Operations. Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, and Multi programmed Control.

UNIT-III	**The Memory System**

The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

UNIT-IV	**Input / Output Organization**

Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.

UNIT-V	**Pipelining, Large Computer Systems**

Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets. Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of GeneralPurpose multiprocessors, Interconnection Networks.

Textbooks:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, “Computer Organization”, 5th Edition, McGraw Hill Education, 2013

Reference Books:

1. M.Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Education.
2. Themes and Variations, Alan Clements, "Computer Organization and Architecture", CENGAGE Learning.
3. SmrutiRanjanSarangi, "Computer Organization and Architecture", McGraw Hill Education.
4. John P.Hayes, "Computer Architecture and Organization", McGraw Hill Education

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	UTILIZATION OF ELECTRICAL ENERGY (Professional Elective -I)	L	T	P	C
		3	0	0	3

III Year I Semester

Course Objectives:

- Provide knowledge on various methods of electrical energy utilization such as heating, welding, and lighting.
- Impart understanding of electric traction systems, their components, and performance characteristics.
- Explain the principles and applications of electrolysis and electric drives in industrial processes.
- Develop the ability to analyze and compare different electrical illumination systems and their design aspects.
- Familiarize students with energy conservation techniques and efficient utilization of electrical energy in industries and transportation.

Course Outcomes (CO):

- Explain the different methods of electrical heating and welding and their industrial applications.
- Describe the laws of illumination and design simple lighting schemes for residential, commercial, and industrial purposes.
- Analyze the performance of various electric traction systems and compute traction-related parameters.
- Discuss the principles of electrolysis and evaluate its role in industrial processes.
- Apply suitable methods for effective utilization and conservation of electrical energy in different applications.

UNIT – I	ELECTRIC DRIVES

Type of electric drives – rating and choice of motor - starting and running characteristics – particular applications of electric drives - types of industrial loads - Continuous - intermittent and variable loads.

UNIT – II	ELECTRIC HEATING & WELDING

Introduction: Advantages and methods of electric heating - resistance heating - induction heating and dielectric heating. Classification- resistance and arc welding - electric welding equipment - comparison between AC and DC Welding.

UNIT – III	ILLUMINATION

Introduction - terms used in illumination - laws of illumination - sources of light. Discharge lamps – mercury vapor and sodium vapor lamps–comparison between tungsten filament lamps and fluorescent tubes–compact fluorescent lamp–LED-Basic principles of light control-Types and design of good lighting system and practice - flood lighting.

UNIT – IV	ELECTRIC TRACTION

Traction systems: System of electric traction and track electrification - Review of existing electric traction systems in India - Special features of traction motor - Speed-time curves for different services - methods of electric braking - plugging - rheostatic braking - regenerative braking. Introduction to Magnetic Levitation vehicles.

UNIT – V	ELECTROLYTIC PROCESS

Introduction - Basic principles - Faradays laws of electrolysis - Energy efficiency – Electrode position -Factors governing deposition Processes - Deposition of Alloys – Extraction and refining of metals. Fuel Cells.

Textbooks

1. C.L Wadhwa, Generation Distribution and Utilization of Electrical Energy, New age International Publishers,
2. J. B. Gupta, Utilization of Electrical Power and Electric Traction, S. K. Kataria and sons, 2002
3. G. C. Garg (2005), Utilization of Electrical Power & Electric traction, 8th edition, Khanna publishers, New Delhi
4. N. V. Suryanarayana, Utilization of Electrical Power including Electric drives and Electric traction, New Age International (P) Limited, Publishers, 1996

Reference Books

1. Partab (2007), Art & Science of Utilization of electrical Energy, 2nd edition, Dhanpat Rai & Sons, New Delhi.
2. Alan. V. Oppenheim, Ronald. W. Schafer, John R Buck, Discrete Time Signal Processing, Prentice Hall, 2ndedition, 2006. E. Openshaw Taylor, Utilization of Electric Energy, Orient Longman, 1971.

Online Learning Resource:

1. https://nptel.ac.in/courses/108105060
2. https://nptel.ac.in/courses/112105221
3. https://vssut.ac.in/lecture_notes/lecture1426861925.pdf
4. https://vpmpee.wordpress.com/uee-3340903/

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ELECTRICAL SAFETY PRACTICES AND STANDARDS (Open Elective-I)	L	T	P	C
		3	0	0	3

III Year I Semester

Course Objectives:

The course is designed to:

- Understand the fundamental concepts, hazards, and physiological effects related to electrical safety.
- Identify and apply appropriate safety components and protective equipment for various electrical systems.
- Analyze grounding and bonding practices to ensure safe electrical installations.
- Implement safety procedures and first-aid measures in different electrical environments and applications.
- Evaluate and interpret electrical safety standards, codes, and statutory regulations for compliance.

Course Outcomes (CO):

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

- Understanding the Fundamentals of Electrical Safety
- Identifying and Applying Safety Components
- Analyzing Grounding Practices and Electrical Bonding
- Applying Safety Practices in Electrical Installations and Environments
- Evaluating Electrical Safety Standards and Regulatory Compliance.

UNIT – I	INTRODUCTION TO ELECTRICAL SAFETY

Fundamentals of Electrical safety-Electric Shock- physiological effects of electric current - Safety requirements – Hazards of electricity- Arc - Blast- Causes for electrical failure.

UNIT – II	SAFETY COMPONENTS

Introduction to conductors and insulators- voltage classification -safety against over voltages- safety against static electricity-Electrical safety equipment's - Fire extinguishers for electrical safety.

UNIT – III	GROUNDING

General requirements for grounding and bonding- Definitions- System grounding-Equipment grounding - The Earth - Earthing practices- Determining safe approach distance-Determining arc hazard category.

UNIT – IV	SAFETY PRACTICES

General first aid- Safety in handling hand held electrical appliances tools- Electrical safety in train stations-swimming pools, external lighting installations, medical locations-Case studies.

UNIT – V	STANDARDS FOR ELECTRICAL SAFETY

Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards-IEEE standards-National Electrical Code 2005 – National Electric Safety code NESC-Statutory requirements from electrical inspectorate

Textbooks

1. Massimo A.G.Mitolo, "Electrical Safety of Low-Voltage Systems", McGraw Hill, USA, 2009.
2. Mohamed El-Sharkawi, "Electric Safety - Practice and Standards", CRC Press, USA, 2014

Reference Books

1. Kenneth G.Mastrullo, Ray A. Jones, "The Electrical Safety Program Book", Jones and Bartlett Publishers, London, 2nd Edition, 2011.
2. Palmer Hickman, "Electrical Safety-Related Work Practices", Jones & Bartlett Publishers, London, 2009.
3. Fordham Cooper, W., "Electrical Safety Engineering", Butterworth and Company, London, 1986.
1. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, "Electrical Safety Hand book, McGraw-Hill, New York, USA, 4th edition, 2012.

Sri Krishnadevaraya University College of Engineering & Technology
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Electrical and Electronics Engineering

Course Code	ELECTRICAL TECHNOLOGY (Open Elective-I)	L	T	P	C
		3	0	0	3

III Year I Semester

Course Objectives:

- To know about various characteristics of DC Generators and motors.
- To know about principle of operation of a DC machine working as a generator and motor.
- To understand computation and predetermination of regulation of a 1-ϕ transformer.
- To know about principle of operation of three phase and single phase induction motor.
- To understand the operation of electrical instruments.

Course Outcomes (CO):

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

- Able to solve the problems the e.m.f. generated on DC Generator.
- Able to acquire knowledge about how to determine the efficiency and regulation of single phase transformer and synchronous machine.
- Analyze the working of induction motors. Uunderstanding the working principle and operation of alternators.
- Able to acquire knowledge about electrical measuring instruments.

UNIT – I	DC MACHINES

Principle of operation of DC machine, EMF Equation, Types of Generators, magnetization and load Characteristics of DC Generators.-Numerical problems DC Motor- Types of DC Motors Characteristics of DC Motors- 3point starters for dc shunt motor-losses and efficiency-Swinburne's test, load test-speed control of DC shunt motor-Numerical problems.

UNIT – II	TRANSFORMERS

Principle of operation of Transformer-constructional features- Phasor Diagram on no load and load – equivalent circuit-losses, efficiency and regulation of a transformer, OC & SC tests on transformer Numerical problems.

UNIT – III	THREE PHASE INDUCTION MOTOR & SINGLE PHASE INDUCTION MOTOR

Three Phase Induction Motor: Principle of operation of 3-phase Induction motor-slip ring and squirrel cage motors- slip torque characteristics-efficiency calculation-starting methods-speed control of induction motor-Numerical problems.

Single Phase Induction Motor: Principle of operation of 1-phase Induction motor- constructional features-shaded pole motors-capacitor motor-split phase motors-equivalent circuit.

UNIT – IV	ALTERNATORS

Constructional features- Principle of operation-types-EMF equation- distribution and coil span factors- pre determination of regulation by synchronous impedance method – OC & SC test- Numerical problems.

UNIT – V	BASIC INSTRUMENTS

Introduction, classification of instruments, operating principles essential features of measuring instruments, Moving coil permanent magnet(PMMC) instruments, Moving iron of Ammeters and Voltmeters(All the above topics are only elementary treatment).

Textbooks

1. Principle of Electrical Engineering by V.K.Mehta, Rohith Mehta, S.Chand publications.
2. Principles of Electrical Engineering by V.K Mehta, S.Chand publications.
3. Electrical Technology-volume II – B L Theraja- S. Chand.

Reference Books

1. Electrical Machinery- J B Guptha- katsonbooks .
2. Electrical Machines – I J Nagrath and D P Kothari- PHI Publications.

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	FPGA BASED CONTROLLER DESIGN (Open Elective-I)	L	T	P	C
		3	0	0	3

III Year 1 Semester

Course Objectives:

- To know about FPGA architecture features and fabrics and basics of VLSI technology
- To learn about logic implementation and design aspects of FPGA
- To understand about performance analysis of sequential machines
- To learn about architectures and multi-FPGA large scale systems

Course Outcomes (CO):

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

- To know about FPGA architecture features and fabrics and basics of VLSI technology
- To learn about logic implementation and design aspects of FPGA
- To understand about performance analysis of sequential machines
- To learn about architectures and multi-FPGA large scale systems

UNIT – I	FPGA ARCHITECTURE AND FABRICS

Programmable Logic Devices-Types-PLA, PAL, FPGA-architectures, SRAM-based FPGAs, Permanently Program FPGAs, Chip I/O. Circuit Design of FPGA Fabrics. Architecture of FPGA Fabrics.

UNIT – II	FPGA-BASED SYSTEMS AND VLSI TECHNOLOGY

Introduction, Basic Concepts, Digital Design and FPGAs. FPGA-based system design. Manufacturing Processes, Deriving Transistor Characteristics, CMOS Logic Gates, Wires, Registers and RAM, Packages and Pads.

UNIT – III	COMBINATIONAL LOGIC

The Logic Design Process. Hardware Description Languages, combinational network delay. Power and energy optimization, arithmetic logic, logic implementation for FPGAs. Physical Design for FPGAs. The Logic Design Process

UNIT – IV	SEQUENTIAL MACHINES

The sequential machine design process. Sequential design styles. Rules for Clocking. Performance Analysis. Power Optimization.

UNIT – V	LARGE SCALE SYSTEMS

Architectures and Large-Scale Systems, Behavioral Design, Design Methodologies. Design Example. Buses, Platform FPGAs, Multi-FPGA Systems, Novel Architectures.

Textbooks

1. FPGA Based System Design, Wayne Wolf, Prentice Hall, 2004.
2. Modern VLSI Design, Wayne Wolf, Pearson Education 2002

Reference Books

1. Advanced Digital Design with verilog HDL, Michael D Ciletti, Pearson Education 2005
2. Verilog HDL, Samir Palnitkar, Pearson Education 2005.
3. A Verilog HDL Primer, J Bhaskar, 2nd edition, B S Publications, 2007.
4. VHDL for Programmable Logic, Kevin Skahill Pearson Education, 2004

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	POWER ELECTRONICS LAB	L	T	P	C
		0	0	3	1.5

III Year I Semester

Course Objectives:

- This course is intended to acquire practical knowledge about the operation of various power converters.
- To understand the basics of triggering circuits required for various power converters.

Course Outcomes (CO):

- Analyze the Characteristics of Power Semiconductor Devices (SCR, MOSFET, and IGBT) and their Role in Power Converters.
- Design and Implement Gate Firing Circuits for SCR-based Power Converters.
- Evaluate the Performance of Single-phase and Three-phase Power Converters with R and RL Loads.
- Apply Different Commutation Techniques to Analyze Inverter for Efficient Power Control.
- Apply Different Commutation Techniques to Analyze Chopper Circuits for Efficient Power Control.

List of Experiments:

Any 10 experiments of the following are required to be conducted
CHOOSE ANY TEN FROM THE FOLLOWING LIST:

1. Study of Characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for SCR's: (a) R triggering (b) R-C triggering.
3. Single Phase AC Voltage Controller with R and RL Loads.
4. Single Phase fully controlled bridge converter with R and RL loads
   Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E).
5. DC Jones chopper with R and RL Loads.
6. Single Phase Parallel inverter with R and RL loads.
7. Single Phase Cycloconverter with R and RL loads.
8. Single Phase Half controlled converter with R and RL load.
9. Single Phase Fully controlled converter with R and RL load.
10. Three Phase half-controlled bridge converter with R, RL-load.
11. Three Phase fully controlled bridge converter with R, RL-load.
12. Single Phase series inverter with R and RL loads.
13. Single Phase Bridge converter with R and RL loads.
14. Single Phase dual converter with RL loads.

References:

1. O.P. Arora, "Power Electronics Laboratory: Theory, Practice and Organization (Narosa series in Power and Energy Systems)", Alpha Science International Ltd., 2007.
2. M. H. Rashid, "Simulation of Electric and Electronic circuits using PSPICE", M/s PHI Publications.
3. PSPICE A/D user's manual – Microsim, USA.
4. PSPICE reference guide – Microsim, USA. 5. MATLAB and its Tool Books user's manual and – Math works, USA.

Online Learning Resources/Virtual Labs:

http://vlabs.iitb.ac.in/vlabs-ev/labs/mit_bootcamp/power_electronics/labs/index.php

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Electrical and Electronics Engineering

Course Code	ANALOG AND DIGITAL CIRCUITS LAB	L	T	P	C
		0	0	3	1.5

III Year 1st Semester

Course Objectives:

- To study the characteristics and applications of semiconductor diodes and transistors.
- To design and analyze rectifiers, amplifiers, and oscillator circuits.
- To implement basic Op-Amp applications. and implement combinational and sequential logic circuits.
- To utilize universal gates for logic circuit realization and clock generation.
- To design and implement essential digital components like adders, multiplexers, flip-flops, encoders, and decoders.

Course Outcomes (CO):

- Interpret the characteristics of diodes and transistors for circuit design.
- Construct and evaluate rectifiers, amplifiers, and oscillator circuits.
- Implement basic Op-Amp applications, combinational and sequential circuits using logic gates.
- Design digital systems using universal gates, multiplexers, and comparators.
- Develop and realize fundamental digital components such as adders, converters, flip-flops, encoders, and decoders.

List of Experiments:

ANALOG CIRCUITS

List of Experiments: (Any 06 Experiments are to be conducted)CB Characteristics

1. CE Characteristics
2. CE Amplifier
3. CC Amplifier
4. Clippers
5. Clampers
6. Hartley & Colpitt's Oscillators.
7. RC Phase shift oscillator
8. Astable multivibrator
9. Monostable multivibrator
10. A to D Convertor
11. D to A Convertor
12. Op-Amp Applications-Adder, subtractor, comparator

DIGITAL CIRCUITS

List of Experiments: (Any 6 Experiments are to be conducted)

1. Realization of Boolean Expressions using Gates
2. Design and realization of logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter
6. Design and realization of 8x1 MUX using 2x1 MUX
7. Design and realization of 4 bit comparator
8. Design and realization of Flip-Flops.
9. Design and realization of Encoders
10. Design and realization of Decoders
11. Design and realization of Comparator.

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Electrical and Electronics Engineering

Course Code	CIRCUITS SIMULATION AND ANALYSIS USING PSPICE	L	T	P	C
		0	1	2	2

III Year I Semester

Course Objectives:

- Simulation of various circuits using PSPICE software.
- Simulation of Different electrical circuits
- Simulation of electrical network theorems.

Course Outcomes (CO):

By the end of the program students should be able to

- Simulation of various circuits using PSPICE software
- Simulation of single-phase RLC circuits.
- Simulation of DC & AC circuits.

List of Experiments:

1. Pspice simulation of nodal analysis for dc circuits
2. Pspice simulation of d.c. circuit for determining Thevenin's equivalent
3. Pspice simulation of d.c.network with subcircuit
4. Pspice simulation of transient and parametric analysis of series RLC circuits usingstep and pulse input
5. Pspice simulation of transient and parametric analysis ofs eries RLC circuits using sine input
6. Analysis of three phase circuit representing generator transmission line and load
7. Pspice simulation of maximum power transfer theorem for dc circuits.
8. Pspice simulation of superposition theorem for dc circuits
9. Pspice simulation of ac circuits
10. Pspice simulation of reciprocity theorem for dc circuits

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Electrical and Electronics Engineering

Course Code	TINKERING LAB	L	T	P	C
		0	0	2	1

III Year I Semester

Course Objectives:

The main objectives of the course are to

- Encourage Innovation and Creativity
- Provide Hands-on Learning and Impart Skill Development
- Foster Collaboration and Teamwork
- Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
- Impart Problem-Solving mind-set

Course Outcomes (CO):

- The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes.
- These labs are designed to demonstrate practical skills that complement theoretical knowledge.

Experiments covering the Topics:

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start- ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

List of Experiments:

1) Make your own parallel and series circuits using breadboard for any application of your choice.
2) Demonstrate a traffic light circuit using breadboard.
3) Build and demonstrate automatic Street Light using LDR.
4) Simulate the Arduino LED blinking activity in Tinkercad.
5) Build and demonstrate an Arduino LED blinking activity using Arduino IDE.
6) Interfacing IR Sensor and Servo Motor with Arduino.
7) Blink LED using ESP32.
8) LDR Interfacing with ESP32.
9) Control an LED using Mobile App.
10) Design and 3D print a Walking Robot
11) Design and 3D Print a Rocket.
12) Build a live soil moisture monitoring project and monitor soil moisture levels of a remote plan in your computer dashboard.
13) Demonstrate all the steps in design thinking to redesign a motor bike.

Online Learning Resources:

1) https://aim.gov.in/pdf/equipment-manual-pdf.pdf
2) https://atl.aim.gov.in/ATL-Equipment-Manual/
3) https://aim.gov.in/pdf/Level-1.pdf
4) https://aim.gov.in/pdf/Level-2.pdf
5) https://aim.gov.in/pdf/Level-3.pdf

Sri Krishnadevaraya University College of Engineering & Technology
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Electrical and Electronics Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
III Year II Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Electrical Measurements and Instrumentation	PC	3-0-0	3
2.		Microprocessors and Microcontrollers	PC	3-0-0	3
3.		Power System Analysis	PC	3-0-0	3
4.		1. AI & ML for Electrical Engineering 2. Programmable Logic Controllers 3. Switchgear and Protection	PE-II	3-0-0	3
5.		1. Communication systems 2. Electric Drives 3. Renewable and Distributed Energy Technologies	PE-III	3-0-0	3
6.		1. Renewable Energy Sources 2. Electric Vehicles 3. Generation of Electric Power	OE-II	0-0-3	3
7.		Electrical Measurements and Instrumentation Lab	PC	0-0-3	1.5
8.		Microprocessors and Microcontrollers Lab	PC	0-1-2	1.5
9.		Applications of Soft Computing Tools in Electrical Engineering	SC	0-0-2	2
10.		Technical Paper Writing & IPR	AC	2-0-0	0
				Total	**23**
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation					

Category	**Credits**
Open Elective Courses	3
Skill Course	2
Professional Core Courses	12
Professional Elective Courses	6
TOTAL CREDITS	**23**

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Electrical and Electronics Engineering

Course Code	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

- To study about the working principle of electrical measuring instruments
- To study the performance of instrumental transformers, power factor, frequency and energy meters
- To study the functioning of DC and AC bridges
- To study the basics of digital volt meters and transducers
- To understand the concept of sensors and data acquisition systems

Course Outcomes (CO):

- Understand principle and working of electrical measuring instruments
- Understand the principle of operation of instrument transformers, energy meters and analog instruments
- Understand the principle and working of various DC and AC bridges for the measurement of Resistance, Inductance and Capacitance.
- Understand the principle and working of different digital voltmeters and transducers.
- Understand the working of various sensors and data acquisition systems.

UNIT – I **MEASURING INSTRUMENTS & DIGITAL METERS**

Fundamentals: True Value, Errors (Gross, Systematic, Random); Static Characteristic of Instruments (Accuracy, Precision, Sensitivity, Resolution & threshold); Error Analysis- Simple problems; Statistical treatment of data- Simple problems.

Indicating Instruments: Three forces in Electromechanical indicating instrument (Deflecting, controlling & damping forces); Moving iron type (attraction and repulsion), PMMC, Electrodynamometer Type instruments: Torque equation (Expression only, no derivation), shape of scale – simple problems on torque equations; Measurement of voltage and current - Extension of Range of ammeter and voltmeter – problems on extension of range of ammeter and voltmeter.

UNIT – II **MEASUREMENT OF POWER, POWER FACTOR AND ENERGY**

Instrument transformers: Types, CT and PT – Ratio and phase angle errors; (Expression only, no derivation)
Measurement of power: Principle and Operation of Single-phase dynamometer wattmeter, expression (Expression only no derivation) for deflecting and control torques, errors and compensations.
Measurement of power factor: Principle and operation of Single-phase Electrodynamometer Power factor meter.
Measurement of Frequency: Principle and Operation of single phase frequency meter- vibrating reed type, - ferro dynamic type meter.
Measurement of Energy: Principle and Operation of Single phase induction type energy meter, driving and braking torques (expression only no derivation), errors and compensations, testing by phantom loading.

UNIT – III **D.C&A.C BRIDGES**

Measurement of Resistance: Methods of measuring low, medium and high resistances –Sensitivity of Whetstone's bridge– Kelvin's double bridge for Measuring low resistance, Megger for measurement of high resistance.
Measurement of Inductance: - Maxwell's bridge, Anderson's bridge.
Measurement of Capacitance: De Sauty bridge. Wien's bridge–Scheringbridge–Numerical problems.

UNIT – IV **DIGITAL VOLT METERS AND TRANSDUCERS**

Digital Voltmeters: Ramp type, Dual Slope integrating type, successive approximation, Potentiometric type DVMs.
Transducers: Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle Operation of Resistor, Inductor and Capacitive Transducers.

vehicles.

UNIT – V **SENSORS AND DATA ACQUISTION**

Silicon based micro sensors: Pressure sensor, Gyro sensor, Accelerometer, Flow sensor, Proximity sensor, Temperature sensor, Humidity sensor. (Elementary treatment only)
Introduction to PLC and SCADA Systems: Data acquisition systems (DAS) and interfacing techniques.

Textbooks:

1. Electrical & Electronic Measurement & Instruments by A.K. Sawhney Dhanpat Rai & Co. Publications, 2007.
2. Electrical Measurements and measuring Instruments–by E.W.Golding and F.C. Widdis, 5th Edition, Reem Publications, 2011.
3. Buckingham and Price, "Electrical Measurements", Prentice – Hall

Reference Books

1. Electronic Instrumentation by H.S.Kalsi,Tata Mcgrawhill, 3rd Edition, 2011.
2. Electrical Measurements: Fundamentals, Concepts, Applications–by Reissl and, M.U, New Age International (P) Limited, 2010.
3. Electrical & Electronic Measurement & Instrumentation by R.K.Rajput, 2nd Edition, S. Chand & Co., 2nd Edition, 2013.
4. Sensor Technology: Hand Book by JonS. Wilson, ELSEVIER publications, 2005

Online Learning Resource:

1. https://onlinecourses.nptel.ac.in/noc22_ee112/preview

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Electrical and Electronics Engineering

Course Code	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

- To comprehend the architecture, operation, and configurations of the 8086 microprocessors.
- To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
- To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
- To learn the architecture, instruction set, and programming of the 8051 microcontrollers.
- To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

Course Outcomes (CO):

- Gain knowledge on the architecture,operation,and configurations of the 8086 microprocessors.L1
- Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.L2
- Know the interfacing of 8086 with memory, peripherals, and controllers for various applications.L2
- Learn the architecture, instruction set, and programming of the 8051 microcontrollers. L2
- Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons. L1

UNIT – I	8086 ARCHITECTURE

Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT – II	8086 PROGRAMMING

Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT – III	8086 INTERFACING

Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT – IV	MICROCONTROLLERS

Microcontroller – Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT – V	INTERFACING MICROCONTROLLERS

Interfacing Microcontroller - Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Textbooks

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition,

Pearson, 2012.

Reference Books

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	POWER SYSTEM ANALYSIS (Professional Core)	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

- The use of per unit values and graph theory concepts, solving a problem using computer.
- Formation of Y_{bus} and Z_{bus} of a Power System network, power flow studies by various methods.
- Different types of faults and power system analysis for symmetrical and also unsymmetrical faults.
- Analysis of power system for steady state and transient stability and also methods to improve stability

Course Outcomes (CO):

- Remember and understand the concepts of per unit values, Y Bus and Z bus formation, load flow studies, symmetrical and unsymmetrical fault calculations.
- Apply the concepts of good algorithm for the given power system network and obtain the converged load flow solution and experiment some of these methods using modern tools and examine the results.
- Analyse the symmetrical faults and unsymmetrical faults and done the fault calculations, analyse the stability of the system and improve the stability..
- Demonstrate the use of these techniques through good communication skills

UNIT – I **PER-UNIT SYSTEM AND Y_{BUS} FORMATION**

Per-Unit representation of Power system elements - Per-Unit equivalent reactance network of a three phase Power System - Graph Theory: Definitions, Bus Incidence Matrix, Y_{Bus} formation by Direct and Singular Transformation Methods, Numerical Problems.

UNIT – II **FORMATION OF Z_{BUS}**

Formation of Z_{Bus}: Partial network, Algorithm for the Modification of Z_{Bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses - Modification of Z_{Bus} for the changes in network

UNIT – III **POWER FLOW ANALYSIS**

Static load flow equations – Load flow solutions using Gauss Seidel Method: Algorithm and Flowchart. Acceleration Factor, Load flow Solution for Simple Power Systems (Max. 3-Buses): Newton Raphson Method in Polar Co-Ordinates Form: Load Flow Solution- Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods

UNIT – IV **SHORT CIRCUIT STUDIES**

Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors. Symmetrical Component Theory: Positive, Negative and Zero sequence components, Positive, Negative and Zero sequence Networks. Symmetrical Fault Analysis: LLLG faults with and without fault impedance, Unsymmetrical Fault Analysis: LG, LL and LLG faults with and without fault impedance, Numerical Problems.

UNIT – V **STABILITY ANALYSIS**

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Derivation of Swing Equation, Power Angle Curve and Determination of Steady State Stability. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Numerical methods for solution of swing equation - Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

Textbooks

1. Computer Methods in Power System Analysis by G.W.Stagg and A.H.El-Abiad, Mc Graw-Hill, 2006.
2. Modern Power system Analysis by I.J.Nagrath&D.P.Kothari, Tata McGraw-Hill Publishing Company, 4th Edition, 2011.

Reference Books
1. Power System Analysis by Grainger and Stevenson, McGraw Hill, 1994. 2. Power System Analysis by Hadi Saadat, McGraw Hill, 1998. 3. Power System Analysis and Design by B.R.Gupta, S. Chand & Company, 2005.
Online Learning Resource https://onlinecourses.nptel.ac.in/noc22_ee120/preview

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Electrical and Electronics Engineering

Course Code	AI & ML for ELECTRICAL ENGINEERING (Professional Elective-II)	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

- Understanding the Basics and Architecture of Artificial Intelligence.
- Analyzing and Applying Artificial Neural Networks (ANN) Concepts.
- Implementing ANN Applications in Real-World Problems.
- Understanding and Applying Fuzzy Logic Concepts.
- Designing and Implementing Fuzzy Logic Applications.

Course Outcomes (CO):

- Understanding the Basics and Architecture of Artificial Intelligence
- Analyzing and Applying Artificial Neural Networks (ANN) Concepts
- Implementing ANN Applications in Real-World Problems
- Understanding and Applying Fuzzy Logic Concepts
- Designing and Implementing Fuzzy Logic Applications

UNIT – I	INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Introduction and motivation - Approaches to AI - Architectures of AI - Symbolic Reasoning System - Rule based Systems - Knowledge Representation - Expert Systems.

UNIT – II	OVERVIEW OF MACHINE LEARNING

The Motivation & Applications of Machine Learning: Learning Associations, Classification, Regression; Supervised Learning; Unsupervised Learning; Reinforcement Learning; Gradient Descent: Batch Gradient Descent, Stochastic Gradient Descent; Data pre processing; Under fitting and Overfitting issues.

UNIT – III	ARTIFICIAL NEURAL NETWORKS

Basics of ANN - Comparison between Artificial and Biological Neural Networks - Basic Building Blocks of ANN - Artificial Neural Network Terminologies - McCulloch Pitts Neuron Model - Learning Rules - ADALINE and MADALINE Models - Perceptron Networks (Continuous and Discrete) – Perceptron Convergence Theorem - Back Propagation Neural Networks - Associative Memories – BAM and Hopfield networks.

UNIT – IV	FUZZY LOGIC

Classical Sets - Fuzzy Sets - Fuzzy Properties, Operations and relations - Fuzzy Logic System - Fuzzification - Defuzzification - Membership Functions - Fuzzy Rule base - Fuzzy Logic Controller Design.

UNIT – V	APPLICATIONS OF AI TECHNIQUES

Load forecasting, Load flow studies, Economic load dispatch, Speed control of DC Motor, Speed Control of Induction Motors.

Textbooks

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Neural Networks using MATLAB", McGraw Hill Edition, 2006.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Third Edition, WILEY India Edition, 2012.
3. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, 3rd edition, 2014
4. Russell. S and Norvig. P, “Artificial Intelligence - A Modern Approach”, 4 th edition, Pearson, 2022

Reference Books

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer International Edition, 2013.
2. Yung C. Shin and Chengying Xu, "Intelligent System - Modeling, Optimization & Control, CRC Press, 2009.
3. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	PROGRAMMABLE LOGIC CONTROLLERS (Professional Elective-II)	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

- The student will be able to:
- Understand the basic functions and types of PLCs, Easy Veep software, its applications
- Understand Classification of PLCs and applications
- Design PLC Programming for various applications
- Analyze PLC Troubleshooting aspects

Course Outcomes (CO):

- Understand different types of PLCs, Its classification and the usage of Easy Veep software
- Analyze the hardware details of Allen Bradley PLC
- Design PLC Programming for various applications
- Apply PLC programming concepts in different fields of Science and Technology
- Develop Instruction using ADD and SUB functions, UP and Down counters

UNIT – I	INTRODUCTION TO PLCS

Basic functions of PLCs, Mechanical relays versus PLC, Different types of PLC's – Allen-Bradley – Micrologix: ML1000, ML1100, SLC500, Compact Logix, Mitsubishi FX series, HMI's, Processor and I/O cards

UNIT – II	PLC COMPUTATIONAL TOOL

Introduction to Easy Veep software, Link between mechanical, electrical and programming documentation, Logic diagrams, Flip-Flop Logic, M8000, M8001 internal bits interpretation, Binary code, data table, manipulation and search engine in Mitsubishi environment Communication between PC and PLC, Communication between PC and HMI, PLC and HMI Serial Local network, Introduction to SLC500

UNIT – III	PLC DEVELOPMENT

PLC software and applications, Boolean algebra – understanding binary code, ADD and SUB functions, UP and Down Counters, Introduction to k1Y0, MOV function, CPR and ZCP functions, SHWT and SHRD instructions, Introduction to Absolutely Drum Instruction. Allen Bradley PLC: Introduction to Rockwell Software, Hardware focus, Hardware considerations (Field wiring, Master Control Relay, VFD), Basic programming and applications, Cascade control – subroutine, Different programs.

UNIT – IV	PLC PROGRAMMING

Programming instructions: Instructions and binary interpretation, Bit Instruction, Timers and counters, Comparison instructions, Programming Instructions - Math instructions, Move and Logical Instructions, Discussions of programming, communications for PLC-Robotic arm, Exercise of setup and monitoring.

UNIT – V	PLC PROGRAMMING

Analog and Digital parameters by using SLC5/03-VFD-Panel Mate series 1700, Practical Troubleshooting, troubleshooting technique, Control system stability and tuning basics. Applications: Process to rewind, test, and integrate with extrusion process for wiring and fibre optic industries, Food industry – yeast, flour distribution and control. Process Medical equipment Industry – Gas analyzer, Leak tester (using CO2), plastic wrapping machines etc.

Textbooks

1. Automating manufacturing systems with PLCs by Hugh Jack, 2010.
2. PLC Hand Book (Automation direct Siemens)

Reference Books

1. Programmable Logic Controllers by R. Bliesener, F Ebel, Festo. Didactic publishers, 2002.
2. Programmable Logic Controllers by W. Bolton, 4th Edition, Newnes, 2006.
3. Introduction to PLCs by Jay F. Hooper, 2nd Edition, Carolina Academic Press, 2006.

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Electrical and Electronics Engineering

Course Code	SWITCHGEAR AND PROTECTION (Professional Elective-II)	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

To make the students learn about:

- The study of different Circuit Breakers and Relays.
- The protection of Generators and Transformers.
- To discuss the causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
- The protection of various feeder bus bars from abnormal conditions and over voltages & importance on neutral grounding for overall protection

Course Outcomes (CO):

- Understand the operation of different circuit breakers and their specifications. -L2
- Analyze the concepts of different relays which are used in real time power system operation. -L3
- Apply various protective schemes for Transformers, Rotating machines. L4
- Explain different protective schemes used for Bus bars and Feeders. L3
- Understand the methods of protection against over voltages and importance of neutral grounding. L2

UNIT – I	CIRCUIT BREAKERS

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages - Restriking Phenomenon, Average, Max. RRRV, Current Chopping and Resistance Switching - CB ratings and Specifications, Selection of CB: Types and Numerical Problems. – Auto reclosures. Description and Operation of- Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT – II	ELECTROMAGNETIC, STATIC AND NUMERICAL RELAYS

Basic Requirements of Relays – Primary and Backup protection - Construction details of – Attracted armature, balanced beam, inductor type and differential relays – Universal Torque equation – Characteristics of over current, Direction and distance relays. Static Relays – Advantages and Disadvantages – Definite time, Inverse and IDMT static relays – Comparators – Amplitude and Phase comparators. Microprocessor based relays – Advantages and Disadvantages – Block diagram for over current (Definite, Inverse and IDMT), Distance Relays, Impedance Relays and Reactance Relays with their Flow Charts

UNIT – III	PROTECTION OF GENERATORS AND TRANSFORMERS

Protection of generators: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on percentage winding unprotected. Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CTs Ratio, Buchholtz relay Protection.

UNIT – IV	PROTECTION OF FEEDERS, TRANSMISSION LINES AND BUSBARS

Protection of Feeders (Radial & Ring main) using over current Relays. Protection of Transmission lines – 3 Zone protection using Distance Relays. Carrier current protection. Protection of Bus bars - Differential protection, Differential Pilot wire protection.

UNIT – V	PROTECTION AGAINST OVER VOLTAGES

Generation of Over Voltages in Power Systems. -Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL. Neutral Grounding, Grounded and Ungrounded Neutral Systems. - Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance – Arcing Grounds and Grounding Practices.

Textbooks

1. Switchgear and Protection – by Sunil S Rao, Khanna Publishers.
2. Power System Protection and Switchgear by Badari Ram, D.N Viswakarma, TMH Publications)

Reference Books

1. Protective Relaying Principles and Applications – J Lewis Blackburn, CRC Press.
2. Numerical Protective Relays, Final Report 2004 – 1009704 EPRI, USA.
3. Protective Relaying Theory and Applications - Walter A Elmore, Marcel Dekker.
4. Transmission network Protection by Y.G. Paithankar, Taylor and Francis, 2009.
5. Power System Protection- P. M. Anderson, Wiley Publishers.

Online Learning Resource

https://onlinecourses.nptel.ac.in/noc22_ee101/preview

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	COMMUNICATION SYSTEMS (Professional Elective-III)	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

- To understand the fundamentals of communication systems and amplitude modulation techniques.
- To learn about the angle modulation techniques and bandwidth considerations in communication systems.
- To gain knowledge on pulse analog modulation and multiple access techniques used in digital communication systems.
- To examine pulse modulation and digital modulation techniques used in modern communication systems.
- To study wireless communication systems, cellular networks, and GSM technology.

Course Outcomes (CO):

- Understand the fundamentals of communication systems and amplitude modulation techniques.
- Learn about the angle modulation techniques and bandwidth considerations in communication systems.
- Gain knowledge on pulse analog modulation and multiple access techniques used in digital communication systems.
- Get familiar with pulse modulation and digital modulation techniques used in modern communication systems.
- Know about wireless communication systems, cellular networks, and GSM technology

UNIT – I	ANALOG COMMUNICATION-I

Elements of communication systems, need for Modulation, Modulation Methods, Baseband and carrier communication Amplitude Modulation (AM), Generation of AM signals, Rectifier detector, Envelope detector, sideband and carrier power of AM, Double side band suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Single sideband (SSB) transmission, VSB Modulation.

UNIT – II	ANALOG COMMUNICATION-II

Angle Modulation & Demodulation: Concept of instantaneous frequency Generalized concept of angle modulation, Bandwidth of angle modulated waves- Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Pre-emphasis & De-emphasis, Illustrative Problems.

UNIT – III	DIGITAL COMMUNICATIONS-I (Qualitative Approach only)

Pulse analog modulation techniques, Generation and detection of Pulse amplitude modulation, Pulse width modulation, Pulse position modulation

Multiple Access Techniques: Introduction to multiple access techniques, FDMA, TDMA, CDMA, SDMA: Advantages and applications

UNIT – IV	DIGITAL COMMUNICATIONS-II (Qualitative Approach only)

Pulse Code Modulation, DPCM, Delta modulation, Adaptive delta modulation, Overview of ASK, PSK, QPSK, BPSK and M-PSK techniques.

UNIT – V	WIRELESS COMMUNICATIONS (Qualitative Approach only)

Introduction to wireless communication systems, Examples of wireless communication systems, comparison of 2G and 3G cellular networks, Introduction to wireless networks, Differences between wireless and fixed telephone networks, Introduction to Global system for mobile (GSM), GSM services and features.

Textbooks

1. H Taub, D. Schilling and Gautam Sahe, "Principles of Communication Systems", TMH, 2007, 3rd Edition.
2. George Kennedy and Bernard Davis, "Electronics & Communication System", 4th Edition, TMH 2009.
3. Wayne Tomasi, "Electronic Communication System: Fundamentals Through Advanced", 2nd edition

Reference Books
1. Simon Haykin, "Principles of Communication Systems", John Wiley, 2nd Edition.
2. Sham Shanmugam, "Digital and Analog communication Systems", Wiley-India edition,2006.
3. Theodore. S.Rapport, "Wireless Communications", Pearson Education, 2nd Edition,2002.

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ELECTRIC DRIVES (Professional Elective-III)	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

- To understand the fundamental concepts, components, and dynamics involved in the operation of electric drives.
- To analyze the performance and control of DC drives fed by single-phase and three-phase converters under different modes of operation.
- To study the operation and characteristics of DC chopper-fed drives and their closed-loop control techniques.
- To comprehend the control strategies of induction motor drives using voltage, frequency, and inverter-based methods.
- To explore the operation and control of synchronous, stepper, and brushless DC motor drives for various industrial applications.

Course Outcomes (CO):

- Evaluate the characteristics and operational aspects of drives operating in different modes.
- Analyze the operational aspects of various controlled rectifiers fed DC drives operating in different sustainable modes of operation.
- Analyze the operational aspects of various controlled chopper fed DC drives operating in different sustainable modes of operation.
- Analyze the operational aspects of various asynchronous motor drives operating in different sustainable modes of operation.

UNIT – I **INTRODUCTION TO ELECTRIC DRIVES**

Electrical drives — block diagram, advantages of electric drive, parts of electric drives, choice of electrical drives, the status of DC and AC drives. Dynamics of electrical drives-fundamental torque equations, speed-torque conventions, and multi-quadrant operation; Concept of steady-state stability. Electric braking methods — regenerative, dynamic and plugging. Modes of operation of electrical drives — steady state, acceleration including starting and deceleration including stopping. Speed control and drive classifications, closed-loop control of drives — current limit control, torque control, speed control and position control (Block diagram only).

UNIT – II **SINGLE-PHASE AND THREE PHASE CONVERTER FED DC DRIVES**

Control of DC separately excited motor by single-phase and three-phase half and full bridged converters — voltage and current waveforms for continuous and discontinuous conduction, speed-torque expressions and characteristics. Single phase half-controlled rectifier fed DC series motor — voltage and current waveforms for continuous and discontinuous conduction, speed-torque expressions and characteristics. Multi-quadrant operation of DC separately excited DC motor fed from fully controlled rectifier - mechanical reversible switch in armature, dual converter and field current reversal.

UNIT – III **DC CHOPPER FED DRIVES**

Control of DC separately excited motor by one ,two and four quadrant choppers - voltage and current waveforms for continuous conduction (motoring, regenerative and dynamic braking), speed-torque expressions and characteristics. Chopper control of DC series motor—operation, speed-torque expressions and characteristics. Closed loop chopper control of separately excited DC motor (Block diagram only).

UNIT – IV **INDUCTION MOTOR DRIVES**

Three phase induction motors — Introduction, Stator variable voltage control — speed-torque characteristics, AC voltage controllers and efficiency of induction motor under voltage control. Stator variable voltage and variable frequency control — slip speed control, torque-power limitations and modes of operation. Voltage Source Inverters (VSIs) and Current Source Inverters (CSIs) fed induction motor and closed loop operation of induction motor drives (Block diagram only). Comparison of VSI and CSI fed drives. Static rotor resistance control, slip power recovery schemes – static scherbius and kramer drive, speed-torque characteristics.

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

UNIT – V	**SYNCHRONOUS AND STEPPER MOTOR DRIVES**

Synchronous Motor Drives: Separate control and self-control of synchronous motors — operations of self-controlled synchronous motors by VSI and CSI. Load commutated CSI fed Synchronous motor—operation and speed torque characteristics. Closed loop control operation of synchronous motor drives (Block diagram only). Stepper Motor Drives: Variable reluctance and permanent magnet operation — features of stepper motor — torques Vs stepping rate characteristics and drive circuits. BLDC motor operation and control.

Textbooks:

1. Gopal K. Dubey, Fundamentals of Electric Drives, Narosa Publications, Alpha Science International Ltd, 2nd Edition, 2002.
2. M. H. Rashid (2003), Power Electronic Circuits, Devices and applications, 3rd edition, Prentice Hall of India, New Delhi, India.
3. Krishnan, Ramu. Electric motor drives: modeling, analysis, and control, 1st Edition, Pearson, 2015.

Reference Books

1. M. D. Singh, K. B. Khanchandani (2008), Power Electronics, 2nd Edition, Tata McGraw Hill Publications, New Delhi.
2. VedamSubramanyam (2008), Thyristor Control of Electric drives, 1st Edition, Tata McGraw Hill Publications, New Delhi, India.
3. S. K. Pillai (2007), A First course on Electrical Drives, 2nd Edition, New Age International (P) Ltd.,NewDelhi
4. P.C. Sen, Principles of Electrical Machines and Power Electronics, Wiley, 3rdEdition, 2013.

Online Learning Resource:

1. https://web.iitd.ac.in/~amitjain/Drives_VTR.pdf
2. https://sde.uoc.ac.in/sites/default/files/sde_videos/Electrical%20Drives%20and%20Controls_0.pdf
3. https://nptel.ac.in/courses/108/104/108104140/
4. https://nptel.ac.in/courses/108/102/108102046/
5. https://swayam.gov.in/nd1_noc19_ee65/preview

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	RENEWABLE AND DISTRIBUTED ENERGY TECHNOLOGIES (Professional Elective-III)	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

- To This course explores each of the principal renewable energy sources in turn. Each technology is examined in terms of the relevant physical principles; the main technologies involved; environmental impact; the size of the potential renewable resource; and the future prospects of green energy.
- This Distributed Generation course is intended to provide knowledge of the benefits of renewable energy generation, availability of distributed generation technology, electricity generation technologies, issues related to grid interconnection, and methods of analyzing the technical and economic feasibility.

Course Outcomes (CO):

- Comprehend the renewable energy scenario, anticipate future energy demand and to understand the abstraction concept of electrical energy from Solar Energy.
- Understand the abstraction concept of electrical energy from wind, bio-mass and Tidal energy sources.
- Understand electrical energy storage along with working of Green Energy.
- Exemplify rudimentary idea of Distributed Generation.
- Comprehend the technical impact, control, and economic aspects of Distributed Generation.

UNIT – I	INTRODUCTION

Fundamentals of renewable energy sources, Types of energy, Renewable and Non- renewable energy, SWOT analysis, Global warming and climate change, World energy transformation by 2050, Prospects of renewable energy in the world, Renewable energy availability in India.

Solar Energy Fundamentals: Solar Spectrum, propagation of solar radiation from the sun to earth; solar radiation geometry: sun-earth geometry, extra-terrestrial and terrestrial radiation.

Solar Thermal: Solar Collectors, Solar parabolic trough, Solar tower, Solar cooker, Solar water heater, Solar dryer, Solar Pond.

UNIT – II	SOLAR ELECTRIC POWER GENERATION

A Generic PV Cell, PV Materials, Equivalent Circuits for PV Cells, Modules and Arrays; I-V Curve under Standard Testing Conditions; Impact of Temperature and Insolation on I-V curves; Shading Impacts on I-V curves; Maximum Power Point Trackers (MPPT).

Wind Energy: Air, Wind, Global and Local Wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Classification of wind energy conversion system (WECS)- Horizontal axis- single, double and multiblade system. Vertical axis- Savonius and darrieus types.

UNIT – III	BIOMASS ENERGY

Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies-fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft).

Tidal Power: fundamental characteristics of tidal power, harnessing tidal energy, advantages, and limitations.

Energy Storage: Stationary Battery Storage – Basics of Lead-Acid batteries, Battery Storage Capacity, Coulomb efficiency instead of energy efficiency, Battery Sizing. Different Battery storage technologies and comparison of their performance. Introduction to Super capacitors.

UNIT – IV	INTRODUCTION TO DG AND ITS GRID INTEGRATION

Introduction: Need for Distributed generation, renewable sources in distributed generation, current scenario in Distributed Generation, Planning of DGs – Siting and sizing of DGs – optimal placement of DG sources in distribution systems.

Grid integration of DGs: Different types of interfaces - Inverter based DGs and rotating machine-based interfaces - Aggregation of multiple DG units. Energy storage elements: Batteries, ultracapacitors, flywheels.

UNIT – V	TECHNICAL IMPACT, ECONOMIC AND CONTROL ASPECTS OF DG

Technical impacts of DGs: Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems Economic and control aspects of DGs: Market facts, issues, and challenges - Limitations of DGs. Voltage control techniques, Reactive power control, Harmonics, Power quality issues. Reliability of DG based systems – Steady-state and Dynamic analysis.

Textbooks

1. Muhammad Kamran, Muhammad Rayyan Fazal, "Renewable Energy Conversion Systems", First Edition, Elsevier Academic Press, 2021.
2. G. D. Rai, Non-Conventional Sources of Energy, Khanna Publisher, 2004

Reference Books

1. G N Tiwari, *Solar Energy: Fundamentals, Design, Modeling and Applications*, Narosa, 2002.
2. Mukund R Patel, *Wind and Solar Power Systems: Design, Analysis, and Operation*, 2nd Edition, Taylor & Francis, 2006.
3. H. Lee Willis, Walter G. Scott, "*Distributed Power Generation – Planning and Evaluation*", Marcel Decker Press, 2000.
4. Gilbert M. Masters, "*Renewable and Efficient Electric Power Systems*", 2nd Edn., IEEE Press, Wiley, 2013.
5. N. Jenkins, J.B. Ekanayake and G. Strbac, "*Distributed Generation*", 1st Edn, The Institution of Engineering and Technology, London, 2010.

Online Learning Resource

1. https://archive.nptel.ac.in/courses/121/106/121106014/#
2. https://onlinecourses.nptel.ac.in/noc22_ch27/preview
3. https://www.nptelvideos.com/lecture.php?id=8517

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	RENEWABLE ENERGY SOURCES (Open Elective-II)	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

- To understand the fundamental principles and operation of various renewable energy sources.
- To identify suitable site selection criteria for different renewable energy systems.
- To analyze factors affecting solar energy measurement, wind energy conversion, and other renewable technologies such as geothermal, biomass, tidal, wave, and fuel cell systems.
- To design and evaluate solar photovoltaic modules and wind energy systems with horizontal and vertical axis configurations.
- To apply the concepts of geothermal, ocean, biomass, and fuel cell energy systems for efficient power generation.

Course Outcomes (CO):

- Understand principle operation of various renewable energy sources.
- Identify site selection of various renewable energy sources.
- Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomasss, Tidal Wave and Fuel cell energies
- Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems.
- Apply the concepts of Geothermal Energy, Ocean Energy, Biomass and Fuel Cells for generation of power.

UNIT – I	SOLAR ENERGY

Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT – II	PV ENERGY SYSTEMS

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems.

UNIT – III	WIND ENERGY

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations.

UNIT – IV	GEOTHERMAL ENERGY

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT – V	MISCELLANEOUS ENERGY TECHNOLOGIES:

Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations. Wave Energy-Principle of working, energy and power from waves, wave energy conversion devices, advantages and limitations. Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration

Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Textbooks

1. G. D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, 2000.
2. Chetan Singh Solanki "Solar Photovoltaics fundamentals, technologies and applications" 2nd Edition PHI Learning Private Limited. 2012.

Reference Books

1. Stephen Peake, "Renewable Energy Power for a Sustainable Future", Oxford International Edition, 2018.
2. S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
3. B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
4. S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria& Sons, 2012.
5. G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.

Online Learning Resource

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ELECTRIC VEHICLES (Open Elective-II)	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

- Remember and understand the differences between conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.
- Analyze various EV configurations, parameters of EV systems and Electric vehicle dynamics.
- Analyze the basic construction, operation and characteristics of fuel cells and battery charging techniques in HEV systems.
- Design and analyze the various control structures for Electric vehicle.

Course Outcomes (CO):

- To understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs. -L2
- Understand Various dynamics of Electric Vehicles. -L2
- To remember and understand various configurations in parameters of EV system and dynamic aspects of EV. -L1
- To analyze fuel cell technologies in EV and HEV systems. -L3
- To analyze the battery charging and controls required of EVs. -L3

UNIT – I	INTRODUCTION TO EV SYSTEMS AND ENERGY SOURCES

Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive- In-wheel drives- EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment- History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.

UNIT – II	EV PROPULSION AND DYNAMICS

Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi- motor configurations- Fixed and variable geared transmission- In-wheel motor configuration- Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration.

UNIT – III	FUEL CELLS

Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.

UNIT – IV	BATTERY CHARGING AND CONTROL

Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction.

Control: Introduction- Modeling of electromechanical system- Feedback controller design approach- PI controller's designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.

UNIT – V	ENERGY STORAGE TECHNOLOGIES

Role of Energy Storage Systems- Thermal- Mechanical-Chemical- Electrochemical- Electrical - Efficiency of energy storage systems- Super Capacitors-Superconducting Magnetic Energy Storage (SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and Smart grid- Energy Management with storage systems- Battery SCADA.

Textbooks

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition
2. Ali Emadi, "Advanced Electric Drive Vehicles", CRC Press, 2017, 1st Edition

Reference Books

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt," Energy Storage in Power Systems" Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016,1st Edition
3. A.G.Ter-Gazarian, "Energy Storage for Power Systems", the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Elelctric, Hybrid Elelctric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004,1st Edition
5. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, 2003, 2nd Edition.

Online Learning Resource

1. https://nptel.ac.in/courses/108/102/108102121/
2. https://nptel.ac.in/syllabus/108103009

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	GENERATION OF ELECTRIC POWER (Open Elective-II)	L	T	P	C
		3	0	0	3

III Year II Semester

Course Objectives:

The objective of this course is to acquire knowledge on

- To know about the principles of power generation. Investigate the line diagram and components inthermal power station.
- To accredit hydro and nuclear power stations.
- To enable the process involved in solar, wind, biogas, geothermal and ocean energy generation
- To analyze economic aspects in power generation and to investigate different tariff methods

Course Outcomes (CO):

- Understand the principles of power generation. Analyze the construction, working andoperating principle, and essential components of Thermal power generating station with their relative merits and demerits.
- Analyze the construction, working and operating principle, and essential components of Hydro and Nuclear power generating stations.
- Analyze the different methods and characteristics of solar, wind, biogas, geothermal and ocean power generating systems along with their economic and environmental aspects.
- Carry out a detailed analysis on the economic aspects of power generation involving various tariff method and costs of generation.

UNIT – I	THERMAL POWER GENERATING SYSTEMS

Block Diagram of Thermal Power Station (TPS) showing paths of Coal, Steam, Water, Air, Ash and Flue Gasses - Brief Description of TPS Components: Economizers, Boilers, Super Heaters, Turbines, Condensers, Chimney and Cooling Towers.

UNIT – II	HYDRO & NUCLEAR POWER GENERATING SYSTEMS

Hydro Power: Selection of Site, Classification, Layout, Description of Main Components.

Nuclear Power: Nuclear Fission and Chain Reaction.- Nuclear Fuels.- Principle of Operation of Nuclear Reactor.-Reactor Components: Moderators, Control Rods, Reflectors and Coolants.- Radiation Hazards: Shielding and Safety Precautions.- Types of Nuclear Reactors and Brief Description of PWR, BWR and FBR.

UNIT – III	SOLAR & WIND POWER GENERATING SYSTEMS

Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Flat Plate and Concentrating Solar Energy Collectors, Different Methods of Energy Storage – PV Cell-V-I Characteristics.
Wind Power Generation: Role and potential of Wind Energy Option, Horizontal and Vertical Axis Wind Mills-Performance Characteristics- Power- Speed & Torque- Speed Characteristics-Pitch & Yaw Controls – Power Electronics Application – Economic Aspects.

UNIT – IV	BIOGAS & GEOTHERMAL POWER GENERATING SYSTEMS

Biogas Power Generation: Principles of Bioconversion, Types of Biogas Digesters–Characteristics ofBio-Gas-Utilization- Economic and Environmental Aspects.

Geothermal and Ocean Power Generation: Principle of Geothermal Energy Methods of Harnessing-Principle of Ocean Energy-Tidal and Wave Energy- Mini Hydel Plants- Economic Aspects.

UNIT – V	ECONOMIC ASPECTS OF POWER GENERATION

Load Curve, Load Duration and Integrated Load Duration Curves-Load Demand, Diversity, Capacity, Utilization and Plant Use Factors- Numerical Problems. Costs Of Generation and their Division Into Fixed, Semi-Fixed and Running Costs. Tariff Methods: Desirable Characteristics of a Tariff Method.-Flat Rate, Block-Rate, Two-Part, Three –Part, and Power Factor Tariff Methods and Numerical Problems.

Textbooks

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd.,2005. Non Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2000.

Reference Books

1. Renewable Energy Resources – John Twidell and Tony Weir, Second Edition, Taylor and Francis Group,2006.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003

Online Learning Resource

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB	L	T	P	C
		0	0	3	1.5

III Year II Semester

Course Objectives:

- Calibration of various electrical measuring instruments
- Accurate determination of inductance and capacitance using AC Bridges
- Measurement of resistance for different range of resistors using bridges
- Performance of transducers and sensors

Course Outcomes (CO):

- Determine the unknown Resistance, Inductance and Capacitance using AC and DC bridges.-L3
- Understand the calibration of single phase energy meter.-L2
- Understand the measurement of power, power factor in a single phase circuit and real, reactive Power in a three phase circuit. -L2
- Extend the range of Ammeter and Voltmeter. -L5
- Understand the working of Transducers, Measure distance, temperature, current, voltage and humidity using sensors. -L2

List of Experiments:

CHOOSE ANY TEN FROM THE FOLLOWING LIST:

1. Measurement of resistance using Wheatstone bridge and Kelvin's Double Bridge.
2. Measurement of inductance using Maxwell's bridge, Anderson bridge.
3. Measurement of capacitance using De-Sauty's bridge, Schering bridge.
4. Calibration of single phase energy meter using direct loading method.
5. Calibration of energy meter using Phantom load kit.
6. Measurement of Power using 3-Voltmeter and 3-Ammeter methods in a single phase Circuit.
7. Measurement to Real and Reactive Power in a three phase circuit.
8. Extension of range of given Ammeter and Voltmeter.
9. Measurement of displacement using LVDT.
10. Study of CRO: Measurement of voltage, current, frequency using lissajous patterns.
11. Measurement of different ranges of temperatures using i)RTD ii)Thermocouple
12. Measurement of strain with the help of strain gauge transducers

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	MICROPROCESSORS AND MICROCONTROLLERS LAB	L	T	P	C
		0	0	3	1.5

III Year II Semester

Course Objectives:

- To become skilled in 8086 Assembly Language programming.
- To understand the detailed software and hardware structure of the microprocessor.
- Train their practical knowledge through laboratory experiments.
- To understand and learn 8051 Microcontroller.

Course Outcomes (CO):

- Formulate a program and implement algorithms using Assembly language
- Describe an Assembly language program for the 8086 Microprocessor.
- Develop programs for different applications in the 8086 Microprocessor.
- Interface peripheral devices with 8086 and 8051.
- Use an Assembly/Embedded C programming approach for solving real-world problems.

List of Experiments:

Any TEN of the experiments are to be conducted

1. **Programs for 16 Bit Arithmetic Operations** (Using various addressing modes)

a) Write an ALP to Perform Addition and Subtraction of Multi precision numbers.
b) Write an ALP to Perform Multiplication and division of signed and unsigned Hexadecimal numbers.
c) Write an ALP to find square, cube and factorial of a given number.

2. Programs Involving Bit Manipulation Instructions

a) Write an ALP to find the given data is positive or negative.
b) Write an ALP to find the given data is odd or even.
c) Write an ALP to find Logical ones and zeros in a given data.

3. Programs on Arrays for 8086

a) Write an ALP to find Addition/subtraction of N no‘s.
b) Write an ALP for finding largest/smallest no.
c) Write an ALP to sort given array in Ascending/descending order.

4. Programs on String Manipulations for 8086

a) Write an ALP to find String length.
b) Write an ALP for Displaying the given String.
c) Write an ALP for Comparing two Strings.
d) Write an ALP to reverse String and Checking for palindrome.

5. Programs for Digital Clock Design Using 8086

a) Write an ALP for Designing clock using INT 21H Interrupt.
b) Write an ALP for Designing clock using DOS Interrupt Functions.
c) Write an ALP for Designing clock by reading system time.

6. Interfacing Stepper Motor with 8086

a) Write an ALP to 8086 processor to Interface a stepper motor and operate it in clockwise by choosing variable step-size.
b) Write an ALP to 8086 processor to Interface a stepper motor and operate it in Anti-clockwise by choosing variable step-size.

7. Interfacing ADC/DAC with 8086

a) Write an ALP to 8086 processor to Interface ADC.
b) Write an ALP to 8086 processor to Interface DAC and generate Square Wave/Triangular Wave/Step

signal.

8. Communication between Two Microprocessors

a) Write an ALP to have Parallel communication between two microprocessors using 8255
b) Write an ALP to have Serial communication between two microprocessor kits using 8251.

9. Programs using Arithmetic and Logical Instructions for 8051

a) Write an ALP to 8051 Microcontroller to perform Arithmetic operations like addition, subtraction,
b) Multiplication and Division.
c) Write an ALP to 8051 Microcontroller to perform Logical operations like AND, OR and XOR.
d) Programs related to Register Banks.

10. Programs to Verify Timers/Counters of 8051

a) Write a program to create a delay of 25msec using Timer0 in mode 1 and blink all the Pins of P0.
b) Write a program to create a delay of 50 µsec using Timer1 in mode 0 and blink all the Pins of P2.
c) Write a program to create a delay of 75msec using counter0 in mode 2 and blink all the Pins of P1.
d) Write a program to create a delay of 80 µsec using counter1 in mode 1 and blink all the Pins of P3.

11. UART Operation in 8051

a) Write a program to transfer a character serially with a baud rate of 9600 using UART.
b) Write a program to transfer a character serially with a baud rate of 4800 using UART.
c) Write a program to transfer a character serially with a baud rate of 2400 using UART.

12. Interfacing LCD with 8051

a) Develop and execute the program to interface16*2 LCD to 8051.
b) Develop and execute the program to interface LCD to 8051 in 4-bit or 8-bit mode.

Reference Books:

1. Kenneth.J.Ayala. The 8051 microcontroller, 3rd edition, Cengage learning,2010.
2. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition2006.
3. The 8051 Microcontroller and Embedded Systems: Using Assembly and C by Muhammad AliMazidi, Janice Gillispie Mazidi, Second Edition.

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Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	APPLICATIONS OF SOFT COMPUTING TOOLS IN ELECTRICAL ENGINEERING (Skill Oriented Course)	L	T	P	C
		0	1	2	2

III Year II Semester

Course Objectives:

- The objectives of this course include:
- Understand the basic concepts of Electrical Engineering.
- Apply the concepts to design MATLAB models.
- Analyse various Electrical engineering applications through MATLAB.

Course Outcomes (CO):

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

- Understand the basic concepts of Electrical Engineering.
- Apply the concepts to design MATLAB models.
- Analyze various Electrical engineering applications through MATLAB.
- Develop real time models using MATLAB.
- Design virtual PMU

List of Experiments:

1. Transient analysis of given electrical network
2. Simulation of 1-phase and 3-phase transformers
3. Study of the dynamics of second order system
4. Implementation of buck and boost dc-dc converters
5. Study on the design of PI controllers and stability analysis for a DC-DC buck Converter
6. Sine-PWM techniques for single-phase half-bridge, full-bridge and three-phase inverters
7. Economic Load Dispatch of (i) Thermal Units and (ii) Thermal Plants using Conventional method
8. Transient Stability Analysis of Power Systems using Equal Area Criterion (EAC)
9. Reactive Power Control in a transmission system (Ferranti effect, Effect of shunt Inductor)
10. Fault studies using Z_{bus} matrix
11. Design of virtual PMU

Wide area control of Two area Kundur system

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Electrical and Electronics Engineering

Course Code	TECHNICAL REPORT WRITING & IPR (Audit Course)	L	T	P	C
		2	0	0	-

III Year II Semester

Course Objectives:

- To enable the students to practice the basic skills of research paper writing
- To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
- To practice the basic skills of performing quality literature review
- To help them in knowing the significance of real life practice and procedure of Patents.
- To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

Course Outcomes (CO):

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

- Identify key secondary literature related to their proposed technical paper writing.
- Explain various principles and styles in technical writing
- Use the acquired knowledge in writing a research/technical paper
- Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc.
- Evaluate different forms of IPR available at national & international level
- Develop skill of making search of various forms of IPR by using modern tools and techniques

UNIT – I **Principles of Technical Writing**

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing .

UNIT – II **Technical Research Paper Writing**

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature-Problem sand Framing Research Questions- Synopsis

UNIT – III **Process of research**

Process of research: publication mechanism: types of journals- indexing-seminars- conferences-proof reading –plagiarism style; seminar & conference paper writing;
Methodology-discussion-results- citation rules

UNIT – IV Introduction to Intellectual property

In **Introduction to Intellectual property**: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights
Trademarks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT – V **Law of copy rights**

Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law **Law of patents:** Foundation of patent law, patent searching process, ownership rights and transfer.Patent law, intellectual property audits.
Textbooks:
1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013 2. Meenakshi Raman, Sangeeta Sharma. Technical Communication:Principles and practices.Oxford.
Online Learning Resources:
1. https://theconceptwriters.com.pk/principles-of-technical-writing/ 2. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html 3. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html 4. https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/ 5. https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf 6. https://lawbhoomi.com/intellectual-property-rights-notes/ 7. https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf

Sri Krishnadevaraya University College of Engineering & Technology
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Electrical and Electronics Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical and Electronics Engineering					
IV Year I Semester					
S. No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Power System Operation and Control	PC	3-0-0	3
2.		Management Science	MC	2-0-0	2
3.		1. Digital Signal Processing 2. Electric Vehicle Technology 3. HVDC & FACTS	PE-IV	3-0-0	3
4.		1. Modern Control Theory 2. Switched Mode Power Conversion 3. Electrical Distribution System	PE-V	3-0-0	3
5.		1. Smart Grid Technologies 2. Design of Photo Voltaic systems 3. Concepts of Power Quality	OE-III	3-0-0	3
6.		1. Electrical & Electronics Instrumentation 2. Intelligent Control Techniques 3. Basics of Power Electronics	OE-IV	3-0-0	3
7.		Power Systems and Simulation Lab	SC	0-1-2	2
8.		Gender Sensitization	AC	2-0-0	-
9.		Evaluation of Industry Internship	-	0-0-2	2
Total					**21**

Category	**Credits**
Professional Elective Courses	6
Open Elective Courses	6
Management Course	2
Skill Course	2
Professional Core Courses	3
Evaluation of Industry Internship	2
TOTAL CREDITS	**21**

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	POWER SYSTEM OPERATION AND CONTROL	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

- Optimal Operation of Thermal Power Stations.
- Hydrothermal Scheduling.
- Modelling of Turbines and Generators.
- Load frequency control of Single Area and Two Area Systems.
- The Shunt and Series Reactive Power Compensations in Power Systems.
- The Key Aspects of Power System Deregulation.

Course Outcomes (CO):

- To Understand the Thermal Station Characteristics and Economic Dispatch Problem of Thermal Units and Understand the Optimal Scheduling of Hydro-Thermal Station with minimization of cost of Thermal station
- To Develop the First Order Models of Turbine, Governor and Generator Load Model
- To Evaluate the Steady State & Dynamic Analysis of Single Area and Two Area Load Frequency Control.
- To Analyze the Series & Shunt Reactive Power Compensation in Transmission and Load Systems.
- To Understand the Aspects of Power System Deregulation.

UNIT – I **OPTIMUM OPERATION THERMAL POWER STATION**

Optimum Operation of Thermal Power Station: Heat Rate Curve – Cost Curve – Incremental Fuel Rate – Incremental Fuel Cost and Production Cost, Input – Output Characteristics of Thermal Power Stations and Hydro Power Stations. Optimum Generation Allocation of Thermal Units without Transmission Line Losses and Optimum Generation Allocation with effect of Transmission Line Losses. Transmission Line Loss Formula, Loss coefficients, Numerical Problems.

UNIT – II **ECONOMIC OPERATION OF HYDRO – THERMAL SCHEDULING OPTIMUM OPERATION OF HYDROTHERMAL POWER STATIONS**

Hydrothermal Coordination Methods – Optimal power flow problem formulation for loss and cost minimization, Solution of optimal power flow problem using Newton's method and Linear Programming technique – Numerical problems.

UNIT – III **LOAD FREQUENCY CONTROL**

MODELLING OF TURBINE & GOVERNOR:
The first order Turbine model, Block Diagram representation of Steam Turbines and approximate Linear models, Mathematical Modelling of Speed Governing Systems – Derivation of small Signal Transfer function – Block Diagram.

SINGLE AREA LOAD FREQUENCY CONTROL:
Necessity of Keeping Frequency constant, Definition of Control Area – Single Area Control – Block Diagram representation of an Isolated Power System – Steady State Analysis – Dynamic Response – Controlled & Uncontrolled case.

TWO AREA LOAD FREQUENCY CONTROL:
Load Frequency control of Two Area system – Controlled and Uncontrolled case, Tie – Line Bias Control. Proportional Plus Integral Control of Single Area and Its Block Diagram Representation, Steady State Response – Load Frequency Control and Economic Dispatch Control.

UNIT – IV **REACTIVE POWER CONTROL**

Overview of Reactive Power Control – Reactive Power Compensation in Transmission Systems – Advantages and Disadvantages of Different Types of Compensating Equipment for Transmission Systems; Load Compensation – Specifications of Load Compensator, Uncompensated and Compensated Transmission Lines: Shunt and Series Compensation

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UNIT – V	**POWER SYSTEM DEREGULATION**
Principle of economics, utility functions, power exchanges, electricity market models, market power indices, ancillary services, transmission and distribution charges, principles of transmission charges, transmission pricing methods, demand-side management, regulatory framework – Numerical problems.	

Textbooks

1. Modern Power System Analysis, D.P.Kothari and I.J.Nagrath, Tata McGraw Hill Publishing Company Ltd.,
2. Electric Energy Systems Theory: An Introduction, Olle I. Elgerd, TMH Publishing Company Ltd., New Delhi, 2nd edition, 1983.

Reference Books

1. Power Generation, Operation and Control, Allen J. Wood and Bruce F. Wollenberg, John Wiley & Sons, Inc., New York, 2nd edition, 1996.
2. Reactive Power Control in Electric Systems, T J E Miller, John Wiley & Sons, New York, 1982.
3. Power System Analysis Operation and Control, Abhijit Chakrabarti and Sunita Halder, PHI Learning Pvt. Ltd., 3rd Edition, 2010.

Online Learning Resource

1. https://archive.nptel.ac.in/courses/108/104/108104052/
2. http://kcl.digimat.in/nptel/courses/video/108104191/L01.html
3. https://nptel.ac.in/courses/108101040

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	MANAGEMENT SCIENCE (Management Elective-I)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

The objectives of this course are

- To provide fundamental knowledge on Management, Administration, Organization & its concepts.
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in management

Course Outcomes(CO):

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

- Understand the concepts & principles of management and designs of organization in a practical world
- Apply the knowledge of Work-study principles & Quality Control techniques in industry
- Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
- Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
- Create Modern technology in management science.

UNIT-I	INTRODUCTION TO MANAGEMENT	

Management - Concept and meaning - Nature-Functions - importance of Management. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles – Abraham Maslow's hierarchy theory of needs - Organizational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

UNITII	OPERATIONS MANAGEMENT	

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control - Deming's contribution to Quality.
Material Management - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure and Stores Management - Marketing Management - Functions of Marketing - Marketing Mix - Channels of Distribution - Marketing Strategies based on Product Life Cycle..

UNIT-III	HUMAN RESOURCES MANAGEMENT (HRM)	

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Evolution of HRM - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment- Employee Selection - Process and Tests in Employee Selection - Employee Training and Development - On-the- job & Off-the-job training methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration.

UNIT-IV	STRATEGIC & PROJECT MANAGEMENT	

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis -Project Management - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

UNIT-V	CONTEMPORARY ISSUES IN MANAGEMENT	

The concept of Management Information System(MIS) - Materials Requirement Planning (MRP) - Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management - Business Process Outsourcing (BPO) - Business Process Re- engineering and Bench Marking - Balanced Score Card - Knowledge Management.
Textbooks:
1. A.R Aryasri, “Management Science”, TMH, 2013 2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.

Sri Krishnadevaraya University College of Engineering & Technology
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Electrical and Electronics Engineering

Course Code	DIGITAL SIGNAL PROCESSING (Professional Elective - IV)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

- To get familiar with the properties of discrete time signals, systems and z-transform.
- To learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.
- To understand the implementations of digital filter structures.
- To analyse the FIR filter design using Fourier series and windowing methods.
- To gain the knowledge on Programmable DSP Devices.

Course Outcomes (CO):

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

- Familiar with the properties of discrete time signals, systems and z-transform.
- Learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.
- Understand the implementations of digital filter structures.
- Analyse the FIR filter design using Fourier series and windowing methods.
- Gain the knowledge on Programmable DSP Devices.

UNIT – I **INTRODUCTION TO DISCRETE TIME SIGNALS AND SYSTEMS**

Introduction to digital signal processing, Review of discrete-time signals and systems, Analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems

Z–Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Illustrative Problems, analysis of linear time-invariant systems in the z-domain, pole-zero stability.

UNIT – II **DISCRETE FOURIER TRANSFORM**

Introduction, Discrete Fourier Series, properties of DFS, Discrete Fourier Transform, Inverse DFT, properties of DFT, Linear and Circular convolution, convolution using DFT.

Fast Fourier Transform: Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequency FFT, Inverse FFT (Radix-2).

UNIT – III **IIR FILTERS**

Introduction to digital filters, Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Frequency transformations, Basic structures of IIR Filters - Direct form-I, Cascade form and Parallel form realizations.

UNIT – IV **FIR FILTERS**

Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase FIR filters, Design of FIR filters using Fourier series and windowing methods (Rectangular, Triangular, Raised Cosine), Comparison of IIR & FIR filters, Basic structures of FIR Filters – Direct form, Cascade form, realizations.

UNIT – V **ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES**

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

Textbooks

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education, 2007.
2. A.V.Oppenheim and R.W. Schaffer, Discrete Time Signal Processing, PHI.

Reference Books

1. S.K.Mitra, Digital Signal Processing – A practical approach, 2nd Edition, Pearson Education, New Delhi, 2004.
2. MH Hayes, Digital Signal Processing, Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using Matlab, Thomson, 2007.

Online Learning Resource

1. https://onlinecourses.nptel.ac.in/noc22_ee99/preview,
2. https://nptel.ac.in/courses/108105055

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ELECTRIC VEHICLE TECHNOLOGY (Professional Elective - IV)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

- Illustrate electric vehicles.
- Understand drive-train topologies.
- Classify various electrical drives
- Classify energy storage technologies.
- Classify different energy management strategies.

Course Outcomes (CO):

- Illustrate electric vehicles.
- Understand drive-train topologies.
- Classify various electrical drives
- Classify energy storage technologies.
- Classify different energy management strategies.

UNIT – I	INTRODUCTION TO ELECTRIC VEHICLES

History of electric vehicles, social and environmental importance of electric vehicles, impact of modern drivetrains on energy supplies.
CASE STUDY: Comparison by efficiency of Conventional, Hybrid, Electric and Fuel cell Vehicles.

UNIT – II	ELECTRIC DRIVE-TRAINS

Basic concept of electric traction, Introduction to various electric drive-train topologies, Power flow control in electric drive-train topologies.

UNIT – III	ELECTRIC DRIVES & CONTROL

Introduction to electric components used in electric vehicles, Control of BLDC Motor, Control of Induction Motor Drive, Permanent Magnet (PM) motor Drive & Switched Reluctance Motor (SRM) Drive.

UNIT – IV	ENERGY STORAGE

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its modeling, SOC, Different Types of Batteries, Super Capacitor based energy storage and its analysis, Fuel Cells, Hybridization of different energy storage devices.

UNIT – V	ENERGY MANAGEMENT STRATEGIES & CHARGING INFRASTRUCTURE

Introduction to energy management strategies used in electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies, Types of EV charging Infrastructure & Standardized Communication protocols for EV charging.
CASE STUDIES: Current issues in electric Vehicles, Thermal Protection of Battery.

Textbooks

1. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2nd Edition, 2017. (Unit-I, II)
2. Ali Emadi, "Advanced Electric Drive Vehicles (Energy, Power Electronics, and Machines)", CRC Press, 2015. (Unit-III)
3. John G. Hayes and A. Goodarzi, "Electric Powertrain - Energy Systems, Power electronics and drives for Hybrid, electric and fuel cell vehicles", Wiley, 2018. (Unit-IV & V)

Reference Books

1. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, 2

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	HVDC AND FACTS (Professional Elective - IV)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

- High voltage DC transmission systems
- Flexible AC transmission systems
- Various configurations of the above, Principle of operation, Characteristics of various FACTS devices

Course Outcomes (CO):

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

- Remember various conventional control mechanisms, transmission networks.
- Understand the necessity of HVDC systems as emerging transmission networks.
- Understand the necessity of reactive power compensation devices.
- Design equivalent circuits of various HVDC system configurations.
- Design and analysis of various FACTS devices.

UNIT – I	INTRODUCTION

Electrical Transmission Networks, Conventional Control Mechanisms-Automatic Generation Control, Excitation Control, Transformer Tap-Changer Control, Phase-Shifting Transformers; Advances in Power-Electronic Switching Devices, Principles and Applications of Semiconductor Switches; Limitations of Conventional Transmission Systems, Emerging Transmission Networks, HVDC and FACTS. Concepts of virtual inertia

UNIT – II	HIGH VOLTAGE DC TRANSMISSION – I

Types of HVDC links - Monopolar, Homopolar, Bipolar and Back-to-Back, Advantages and disadvantages of HVDC Transmission, Analysis of Graetz circuit, Analysis of bridge circuit without overlap, Analysis of bridge with overlap less than 60^0, Rectifier and inverter characteristics, complete characteristics of rectifier and inverter, Equivalent circuit of HVDC Link.

UNIT – III	HIGH VOLTAGE DC TRANSMISSION – II

Desired features and means of control, control of the direct current transmission link, Constant current control, Constant ignition angle control, Constant extinction angle control, Converter firing- angle control-IPC and EPC, frequency control and Tap changer control, Starting, Stopping and Reversal of power flow in HVDC links.

UNIT – IV	FLEXIBLE AC TRANSMISSION SYSTEMS-I

Types of FACTS Controllers, brief description about various types of FACTS controllers, Operation of 6-pulse converter, Transformer Connections for 12-pulse, 24-pulse and 48-pulse operation, principle of operation of various types of Controllable shunt VAR Generation, Principle of switching converter type shunt compensator, principles of operation of various types of Controllable Series VAR Generation, Principle of Switching Converter type series compensator.

UNIT – V	FLEXIBLE AC TRANSMISSION SYSTEMS-II

Unified Power Flow Controller (UPFC) – Principle of operation, Transmission Control Capabilities, Independent Real and Reactive Power Flow Control; Interline Power Flow Controller (IPFC) – Principle of operation and Characteristics, UPFC and IPFC control structures (only block diagram description), objectives and approaches of voltage and phase angle regulators.

Textbooks

1. Narain G. Hingorani and Laszlo Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2000.
2. E.W. Kimbark, Direct current transmission, Vol. I, Wiley Interscience, New York, 1971

Reference Books

1. K R Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International

Publishers, New Delhi, 2007.
2. AnriqueAcha, Claudio R. Fuerte-Esquivel, Hugo Ambriz-Pérez and César Angeles-Camacho, FACTS: Modelling and Simulation in Power Networks, John Wiley & Sons, West Sussex, 2004.
3. R Mohan Mathur and Rajiv K Varma, Thyristor-Based FACTS Controllers for Electrical Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2002.

Online Learning Resource

1. https://nptel.ac.in/courses/108104013,
2. https://nptel.ac.in/courses/108107114

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	MODERN CONTROL THEORY (Professional Elective - V)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

- To familiarize the state space representation in controllable, observable, diagonal and Jordan canonical forms.
- Introduce the concept of controllability and observability teststhrough canonical forms and design of state feedback controller by pole placement technique and State Observer design.
- Analysis of a nonlinear system using describing function approach.
- Illustrate the Lypanov's method of stability analysis for linear and non-linear continuous time autonomous systems.

Course Outcomes (CO):

- Analyse different canonical forms - solution of State equation.
- Design of control system using the pole placement technique is given after introducing the concept of controllability and observability.
- Analyze nonlinear system using describing function technique and phase plane analysis. -
- Examine the stability analysis using Lyapunov method. -
- Illustrate the Minimization of functional using calculus of variation - state and quadratic regulator problems.

UNIT – I	STATE SPACE ANALYSIS

State Space Representation – Canonical forms – Controllable canonical form – Observable canonical form - Jordan Canonical Form - Solution of state equation – State transition matrix.

UNIT – II	CONTROLLABILITY - OBSERVABILITY AND DESIGN OF POLE PLACEMENT

Tests for controllability and observability for continuous time systems – Time varying case – Minimum energy control – Time invariant case – Principle of duality – Controllability and observability form Jordan canonical form and other canonical forms – Effect of state feedback on controllability and observability – Design of state feedback control through pole placement.

UNIT – III	NONLINEAR SYSTEMS

Introduction to nonlinear systems - Types of nonlinearities. Introduction to phase–plane analysis - Singular points; Describing function - basic concepts - Describing functions of non- linearities.

UNIT – IV	STABILITY ANALYSIS BY LYAPUNOV METHOD

Stability in the sense of Lyapunov – Lyapunov's stability and Lyapunov's instability theorems – Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems.

UNIT – V	CALCULUS OF VARIATIONS

Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints –Euler lagrangine equation.

Textbooks

1. Modern Control System Theory – by M. Gopal - New Age International Publishers - 2ndedition – 1996.
2. Modern Control Engineering – by K. Ogata - Prentice Hall of India - 3rd edition – 1998.

Reference Books

1. Automatic Control Systems by B.C. Kuo - Prentice Hall Publication.
2. Control Systems Engineering by I.J. Nagarath and M.Gopal - New Age International (P) Ltd.
3. Digital Control and State Variable Methods – by M. Gopal - Tata Mc Graw–Hill Companies - 1997.
4. Systems and Control by Stainslaw H. Zak - Oxford Press - 2003.
5. Optimal control theory: an Introduction by Donald E.Kirk by Dover publications.

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Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	SWITCHED MODE POWER CONVERSION (Professional Elective - V)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

- Understand basic concepts of DC-DC converters
- Understand the concepts of resonant converters and their classification, various types of multilevel inverters, power conditioners, UPS and filters.
- Apply various modulation and harmonic elimination techniques over the converters.
- Analyze the state space modelling of various types of converters.
- Design inductor and transformer for various power electronic applications.

Course Outcomes (CO):

- Remember basic concepts of various converters.
- Understand the problems and to design of various DC-DC converters, advanced converters of SMPCs. -
- Evaluate the performance of resonant converters. -
- Analyze the performance characteristics of 1-ϕ and 3-ϕ inverters with single/multi levels, power conditioners, UPS and filters. -
- Design various applications of the above in Power Systems, EVE, Renewable Energy Systems, etc.

UNIT – I	DC-DC CONVERTERS

Principles of step-down and step-up converters – Analysis and state space modelling of Buck, Boost, Buck- Boost and Cuk converters – Numerical Examples

UNIT – II	SWITCHING MODE POWER CONVERTERS

Analysis and state space modelling of flyback, Forward, Luo, Half bridge and full bridge converters- control circuits and PWM techniques – Numerical Examples

UNIT – III	RESONANT CONVERTERS

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS, Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control – Numerical Examples

UNIT – IV	DC-AC CONVERTERS

Single phase and three phase inverters, control using various (sine PWM, SVPWM and advanced modulation) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

UNIT – V	POWER CONDITIONERS, UPS & FILTERS

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

Textbooks

1. Power Electronics: Essentials and Applications by L. Umanand, Wiley, 2009
2. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.
3. Course material on Switched Mode Power Conversion by V Ramanarayanan, Dept. of Electrical Engg. IISc.Bangalore.

Reference Books

1. Philip T. Krein, "Elements of Power Electronics", Oxford University Press, 2012
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters, Applications and design, 3rd Edition, John Wiley and Sons, 2006
3. M.H. Rashid, Power Electronics circuits, devices and applications, 3rd Edition Prentice Hall of India New Delhi, 2007.

Online Learning Resource

1. https://nptel.ac.in/courses/108108036
2. https://nptel.ac.in/courses/108105180

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ELECTRICAL DISTRIBUTION SYSTEM (Professional Elective - V)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

- To know about fundamental aspects of distribution system, principle of distribution substations.
- To know about classification of various loads.
- To understand difference between conventional load flow studies of power system and distribution system load flow.
- To know about evaluation of voltage droop and power loss calculations, distribution automation and management system, SCADA.

Course Outcomes (CO):

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

- Understand fundamental aspects of distribution system and various factors affecting the distribution systems.
- Analysis of substations and modelling of loads.
- Understand difference between conventional load flow studies of power system and distribution system load flow.
- Evaluation of voltage drop and power loss calculations and capacitor location and cost analysis.
- Analyse the concepts of SCADA, Automation distribution system and management.

UNIT – I **DISTRIBUTION SYSTEM FUNDAMENTALS**

Brief description about electrical power transmission and distribution systems, Different types of distribution sub-transmission systems, Substation bus schemes, Factors effecting the substation location, Factors effecting the primary feeder rating, types of primary feeders, Factors affecting the primary feeder voltage level, Factors effecting the primary feeder loading.

UNIT – II **DISTRIBUTION SYSTEM SUBSTATIONS AND LOADS**

Substations: Rating of a distribution substation for square and hexagonal shaped distribution substation, Service area with "n" primary feeders, K constant, Radial feeder with uniformly and non-uniformly distributed loading. Benefits derived through optimal location of substations.

Loads: Various types of loads, Definitions of various terms related to system loading, Distribution transformer loading, feeder loading, Relationship between the Load Factor and Loss Factor, Modelling of star and delta connected loads.

UNIT – III **DISTRIBUTION SYSTEM LOAD FLOW**

Exact line segment model, Modified line model, approximate line segment model, Step-Voltage Regulators, Line drop compensator, Forward/Backward sweep distribution load flow algorithm – Numerical problems

UNIT – IV **VOLTAGE DROP AND POWER LOSS CALCULATION**

Analysis of non-three phase primary lines, concepts of four-wire multi-grounded common-neutral distribution system, Percent power loss calculation, Distribution feeder cost calculation methods, Capacitor installation types, Series and Shunt Capacitors, Types of three-phase capacitor-bank connections, Procedure for best capacitor location, Economic justification for capacitors – Numerical problems.

UNIT – V **DISTRIBUTION AUTOMATION**

Distribution automation, distribution management systems, distribution automation system functions, Basic SCADA system, Consumer Information Service (CIS) – Geographical Information System (GIS) – Automatic Meter Reading (AMR), Outage management, decision support applications, substation automation, control feeder automation.

Textbooks

1. Distribution System Modelling and Analysis, William H. Kersting, CRC Press, Newyork, 2002.
2. Electric Power Distribution System Engineering, TuranGonen, McGraw-Hill Inc., New Delhi, 1986.

Reference Books

2. Control and automation of electrical power distribution systems, James Northcote-Green and Robert Wilson, CRC Press (Taylor & Francis), New York, 2007.
3. Biswarup Das, Power distribution Automation, IET publication, 2016.
4. Dr. M. K. Khedkar, Dr. G.M. Dhole, Electric Power Distribution Automation, Laxmi Publications, First edition, 2017.

Online Learning Resource

1. https://onlinecourses.nptel.ac.in/noc22_ee126/preview

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	SMART GRID TECHNOLOGIES (Open Elective-III)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

The objectives of this course is to acquire knowledge on

- To know about the principles of power generation. Investigate the line diagram and components in thermal power station.
- To accredit hydro and nuclear power stations.
- To enable the process involved in solar, wind, biogas, geothermal and ocean energy generation
- To analyze economic aspects in power generation and to investigate different tariff methods

Course Outcomes (CO):

- Understand the principles of power generation. Analyze the construction, working andoperating principle, and essential components of Thermal power generating station with their relative merits and demerits.
- Analyze the construction, working and operating principle, and essential components of Hydro and Nuclear power generating stations.
- Analyze the different methods and characteristics of solar, wind, biogas, geothermal and ocean power generating systems along with their economic and environmental aspects.
- Carry out a detailed analysis on the economic aspects of power generation involving various tariff method and costs of generation.

UNIT – I **THERMAL POWER GENERATING SYSTEMS**

Block Diagram of Thermal Power Station (TPS) showing paths of Coal, Steam, Water, Air, Ash and Flue Gasses - Brief Description of TPS Components: Economizers, Boilers, Super Heaters, Turbines, Condensers, Chimney and Cooling Towers.

UNIT – II **HYDRO & NUCLEAR POWER GENERATING SYSTEMS**

Hydro Power: Selection of Site, Classification, Layout, Description of Main Components.

Nuclear Power: Nuclear Fission and Chain Reaction.- Nuclear Fuels.- Principle of Operation of Nuclear Reactor.-Reactor Components: Moderators, Control Rods, Reflectors and Coolants.- Radiation Hazards: Shielding and Safety Precautions.- Types of Nuclear Reactors and Brief Description of PWR, BWR and FBR.

UNIT – III **SOLAR & WIND POWER GENERATING SYSTEMS**

Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Flat Plate and Concentrating Solar Energy Collectors, Different Methods of Energy Storage – PV Cell-V-I Characteristics.
Wind Power Generation: Role and potential of Wind Energy Option, Horizontal and Vertical Axis Wind Mills-Performance Characteristics- Power- Speed & Torque- Speed Characteristics-Pitch & Yaw Controls – Power Electronics Application – Economic Aspects.

UNIT – IV **BIOGAS & GEOTHERMAL POWER GENERATING SYSTEMS**

Biogas Power Generation: Principles of Bioconversion, Types of Biogas Digesters–Characteristics ofBio-Gas-Utilization- Economic and Environmental Aspects.
Geothermal and Ocean Power Generation: Principle of Geothermal Energy Methods of Harnessing-Principle of Ocean Energy-Tidal and Wave Energy- Mini Hydel Plants- Economic Aspects.

UNIT – V **ECONOMIC ASPECTS OF POWER GENERATION**

Load Curve, Load Duration and Integrated Load Duration Curves-Load Demand, Diversity, Capacity, Utilization and Plant Use Factors- Numerical Problems. Costs Of Generation and their Division Into Fixed, Semi-Fixed and Running Costs. Tariff Methods: Desirable Characteristics of a Tariff Method.-Flat Rate, Block-Rate, Two-Part, Three –Part, and Power Factor Tariff Methods and Numerical Problems.

Textbooks

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999. 2. Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd.,2005. Non Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2000.
Reference Books
1. Renewable Energy Resources – John Twidell and Tony Weir, Second Edition, Taylor and Francis Group,2006. 2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003
Online Learning Resource

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	DESIGN OF PHOTOVOLTAIC SYSTEMS (Open Elective-III)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

To make the student learn about

- Basics of PV Cell
- Energy Estimation and costing
- Maximum Power Point Tracking
- PV Interfacing

Course Outcomes (CO):

- Understand the basic concepts of PV Cells
- Understand the concepts of Energy estimation and Sizing
- Design MPPT
- Analyze PV system along with its interfacing

UNIT – I	PV CELL

A historical perspective, PV cell characteristics and equivalent circuit, Model of PV cell, Short Circuit, Open Circuit and peak power parameters, Datasheet study, Cell efficiency, Effect of temperature, Temperature effect calculation example, Fill factor, PV cell simulation, Series and Parallel Interconnection

UNIT – II	ENERGY ESTIMATION AND SIZING PV

Energy from Sun, insolation and irradiance, insolation variation with time delay, Solar geometry, Insolation on a horizontal flat plate, Sunrise and sunset hour angles, Energy plots in octave, atmospheric effects, air mass, Clearness index, Sizing PV for applications without batteries, Examples, Batteries: Introduction, Capacity, C-rate, efficiency, energy and power densities, Battery selection, other energy storage methods, PV system design

UNIT – III	MAXIMUM POWER POINT TRACKING

MPPT concept, Input impedance of DC-DC converters - Boost converter, Buck converter, Buck-Boost converter, PV module in SPICE, Simulation - PV and DC-DC interface, Impedance control methods-voltage scaling, current scaling, Sampling method, Power slope method 1, Power slope method 2, Hill climbing method, Practical points - Housekeeping power supply, Gate driver, MPPTfor non-resistive loads, Simulation

UNIT – IV	PV-BATTERY INTERFACE

Direct PV-battery connection, Charge controller, Battery charger - Understanding current control, slope compensation, simulation of current control, Batteries in series - charge equalisation, Batteries in parallel
Peltier device – principle, Peltier element – datasheet, Peltier cooling, Thermal aspects- Conduction, Convection, A peltier refrigeration example, Radiation and mass transport, Demo of Peltier cooling,
PV and Water pumping

UNIT – V	PV AND GRID INTERFACE

Grid connection principle, PV to grid topologies,3ph d-q controlled grid connection- introduction, dq-axis theory, AC to DC transformation, DC to AC transformation, Complete 3ph grid connection, 1ph d-q controlled grid connection, 3ph PV-Grid interface example, SVPWM - discrete implementation, analog implementation, Application of integrated magnetics, LIFE CYCLE
COSTING Growth models, examples, Annual payment and present worth factor, Examples

Textbooks

1. Design of Photovoltaic Systems by L. Umanand.

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	CONCEPTS OF POWER QUALITY (Open Elective-III)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

To make the student learn about

- To learn about voltage disturbances and power transients that is occurring in power systems.
- To know about voltages and transient over voltages for quality of power supply
- To understand about harmonics and the its mitigation
- To study about different power quality measuring and monitoring concepts. To know about long duration voltage variations

Course Outcomes (CO):

- Understand the basic concepts of different power quality issues and to mitigate them, principles of regulation of long duration voltage variations
- Analyze voltage disturbances and power transients that are occurring in power systems.
- Understand the concept of harmonics in the system and their effect on different power system equipment.
- Apply the knowledge about different power quality measuring and monitoring concepts.

UNIT – I	POWER QUALITY ISSUES

Power quality, voltage quality, The power quality Evaluation procedure, Terms and Definitions, Transients, Long- duration voltage variations, short-duration voltage variations, voltage imbalance, wave form distortion, voltage fluctuation, power frequency variations, power quality terms CBEMA and ITI curves.

UNIT – II	VOLTAGE SAGS AND TRANSIENT OVER VOLTAGES

Sources of sags and interruptions, Estimating voltage sag performance, fundamental principles of protection, solutions at the end-use level, Motor-starting sags and utility system fault-clearing issues, sources of over voltages, principles of over voltage protection, devices for over voltage protection, Utility capacitor-switching transients, utility system lightning protection.

UNIT – III	FUNDAMENTALS OF HARMONICS

Harmonic sources from commercial and industrial loads, locating harmonic sources, Power system response characteristics, Harmonics Vs transients, Effect of harmonics, harmonic distortion, voltage and current distortion, harmonic indices, inter harmonics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive and active filters, IEEE and IEC Standards.

UNIT – IV	LONG-DURATION VOLTAGE VARIATIONS

Principles of regulating the voltage, Devices for voltage regulation, utility voltage regulator Application, capacitorsfor voltage regulation, End user capacitor applications, flicker.

UNIT – V	POWER QUALITY BENCH MARKING AND MONITORING

Bench marking process, RMS Voltage variation Indices, Harmonic indices Power Quality Contracts, Monitoring considerations, power quality measurement equipment, Power quality Monitoring standards

Textbooks

1. Electrical Power Systems Quality by Roger C.Dugan, Mark F.Mc Granaghan, Surya Santos o, H.Wayne Beaty, 2nd Edition, TMH Education Pvt. Ltd, 2012
2. Power quality by C.Sankaran, C R C Press, 2017

Reference Books

1. Electrical systems quality Assessment by J. Arrillaga, N.R. Watson, S.Chen, John Wiley& Sons,2000.
2. Understanding Power quality problems by Math H.J.Bollen, Wiley-IEEE Press, 2000.

Online Learning Resource

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	ELECTRICAL & ELECTRONICS INSTRUMENTATION (Open Elective-IV)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

To make the student learn about

- Measuring system, Common errors, Objectives of Measuring systems
- Test signals and modulation phenomenon, Data acquisition system, various telemetry systems and various modulation systems
- Measuring various meters and analyzers
- Basic transducers and their usage in various measurements.

Course Outcomes (CO):

- Understand Measuring systems, error measurements, test signals, different types of data transmission and modulation techniques
- Analyze various telemetry systems, basic operation of Data acquisition systems, measuring meters and signal analyzers.

UNIT – I **INSTRUMENT ERRORS**

Measuring Systems, Objectives of Measuring Instruments, definition of terms-Spam & Range, Sensitivity, Threshold & Resolution, Accuracy, Precision & Reliability, Performance Characteristics- Static Characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical evaluation of measuring data – Numerical Problems

UNIT – II **DATA TRANSMISSION AND TELEMETRY**

Signals and Their Representation: Standard Test, Periodic, Aperiodic, Modulated Signal, Sampled Data, Pulse Modulation and Pulse Code Modulation. Methods of Data Transmission – General Telemetry System. Frequency Modulation System (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM. Analog and Digital Acquisition Systems – Components of Analog DAS – Types of Multiplexing Systems: Time Division and Frequency Division Multiplexing – Digital DAS – Block Diagram — Modern Digital DAS (Block Diagram)

UNIT – III **SIGNAL ANALYZERS**

Wave Analyzers- Frequency Selective Analyzers, Heterodyne, Application of Wave Analyzers-Harmonic Analyzers, Total Harmonic Distortion, Spectrum Analyzers, Basic Spectrum Analyzers, Spectral Displays, Vector Impedance Meter, Q Meter. Peak Reading and RMS Voltmeters

UNIT – IV **TRANSDUCERS**

Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle Operation of Resistor, Inductor and Capacitive Transducers; LVDT and its Applications, Strain Gauge and Its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Piezo Electric Transducers, Photo electric Transducers, Hall effect, Photo Diodes.

UNIT – V **MEASUREMENT OF NON-ELECTRICAL QUANTITIES**

Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque,Temperature, Pressure, Vacuum, Flow, Liquid level

Textbooks

1. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India, 2004.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K.Sawhney, Dhanpat Rai & Co., 2012.

Reference Books

1. Electronic Instrumentation-by H.S.Kalsi Tata MCGraw-Hill Edition, 3/e., 2010.
2. Modern Electronic Instrumentation and Measurement techniques – by A.DHelfrick and W.D.Cooper,

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	INTELLIGENT CONTROL TECHNIQUES (Open Elective-IV)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

To make the student learn about

- To get exposed to a few Intelligent Control Techniques
- To learn about Artificial Neural Network based Estimators
- To learn about Fuzzy Logic Control System as one of the ICT
- To learn about a few evolutionary algorithms, implement the various ICTs for linear and non-linear systems as case studies

Course Outcomes (CO):

- Understand various Intelligent Control Techniques
- Design the controllers and estimators using ANN and Fuzzy Logic
- Apply Evolutionary algorithms suitable to optimize and design a given system specifications
- Designing of various ICTs for system modeling, control schemes and to design estimators using MATLAB tool boxes

UNIT – I **FUNDAMENTALS OF AI**

AI trend in Engineering applications, Need for AI, Approaches to intelligent control; Architectures for intelligent control; Symbolic reasoning system; rule-based systems; Knowledge representation; Expert systems.

UNIT – II **ANN BASED CONTROLLERS AND ESTIMATORS**

Concept of Artificial Neural Networks and its basic mathematical model; McCulloch-Pitts neuron model; Learning and Training the neural network-Supervised and unsupervised learning concepts, simple perceptron; Adaline and Madaline; Feed-forward Multilayer Perceptron – Back Propagation algorithm; BAM networks, Self-organizing network and Recurrent network; Neural Network based controllers and estimators design.

UNIT – III **FUZZY LOGIC CONTROL SYSTEM**

Motivation and basic definitions; Crisp sets, Fuzzy sets, difference between crisp and fuzzy sets, Fuzzy properties, operations and relations; Fuzzy logic system and its components; Membership functions and methods for assignment of membership function values, Fuzzy knowledge and rule bases; Fuzzy modelling and control schemes for linear and nonlinear systems; Fuzzy estimators.

UNIT – IV **CASE STUDIES**

Identification and control of linear and nonlinear dynamic systems using Neural Networks, Power System Load Flow using Back Propagation algorithm; Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, Single area Load Frequency Control using Fuzzy Logic.

UNIT – V **CASE STUDIES**

Optimization for controller design in case of constrained and unconstrained optimization issues, Economic Load Dispatch using Genetic Algorithm/PSO

Textbooks

1. Jacek. M. Zurada; "Introduction to Artificial Neural Systems", Jaico Publishing House, 1st Edition, 1994
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, WILEY Publications, 2011
3. S.N. Sivanandam and S.N. Deepa, Introduction to Genetic Algorithms, Springer Publications,2008

Reference Books

1. J.S.R. Jang, C.T.Sun and E. Mizutami, “Neuro-Fuzzy & Soft Computing”, Pearson India Education Service Pvt. Ltd.
2. Laurere Fauselt, “Fundamentals of Neural Networks”, Pearson India Education Services Pvt. Ltd.
3. Padhy.N.P.; “Artificial Intelligence and Intelligent Systems”; Oxford University Press, 2005

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	BASICS OF POWER ELECTRONICS (Open Elective-IV)	L	T	P	C
		3	0	0	3

IV Year I Semester

Course Objectives:

The objectives of this course is to acquire knowledge on

- Characteristics of various power semiconductor devices and analyze the operation of silicon-controlledrectifier.
- Operation of half-wave and full-wave phase-controlled rectifiers and analyze harmonics in the inputcurrent.
- Operation of three phase full-wave converter and dual converter.
- Operation of ac voltage controller, single phase cyclo converters and high frequency dc-dc converters.
- Working of inverters and application of pwm techniques for voltage control and harmonic mitigation.

Course Outcomes (CO):

The students should be able to

- Draw the characteristics of various power semiconductor devices and analyze the operation of silicon-controlled rectifier.
- Analyze the operation of half-wave and full-wave phase-controlled rectifiers and harmonics in the input current.
- Explain the operation of three phase full converter and dual converter.
- Explain the operation of AC voltage controller, single phase cyclo converter and high frequency dc-dc converters.
- Apply PWM technique for voltage control and harmonic mitigation

UNIT – I	POWER SEMI-CONDUCTOR DEVICES

Power transistors- Basic structure and working of power MOSFET and power IGBT. Characteristics of power MOSFET and power IGBT-Silicon controlled rectifiers (SCR's)- Basic theory of operation of SCR-Static & Dynamic characteristics of SCR- Turn on and turn off methods of SCR-Snubber circuit Design.

UNIT – II	SINGLE PHASE - PHASE CONTROLLED RECTIFIERS AND HARMONIC ANALYSIS

Half wave converters with R, RL and RLE loads- Derivation of average output voltage and output current-Effect of freewheeling diode for RL load. Fully controlled converters with R, RL and RLE loads-Derivation of output voltage and current - Effect of source Inductance. Semi Converters (Half Controlled) operation with R, RL and RLE loads - Harmonic analysis for input/source current waveform in a system with a large load inductance - Calculation of input power factor.

UNIT – III	THREE PHASE - PHASE CONTROLLED RECTIFIERS

Three Phase Half wave and Full wave converters with R and RL loads-Semi converter (Half Controlled) with R and RL loads- Derivation of average and rms output voltages-Line commutated Inverter operation-Dual converters with non-circulating and circulating currents.

UNIT – IV	AC-AC AND DC-DC CONVERTERS

Single phase AC voltage controller with R and RL load- Single phase Bridge type Cyclo converter with R and RL load (Principle of operation) -High frequency DC-DC converters: Buck Converter operation, Time ratio control and current limit control strategies-Voltage and current waveforms-Derivation of output voltage-Boost converter operation-Voltage and current waveforms-Derivation of output voltage - Buck-Boost converter operation – Voltage and current waveforms.

UNIT – V	DC-AC INVERTERS

Single phase half bridge and full bridge inverters - Three phase Inverters (120^0 and 180^0 modes of operation) - PWM techniques-Single Pulse, Multiple Pulse and Sinusoidal PWM, amplitude and frequency modulation Indices -Harmonic analysis.

Textbooks

1. Power Electronics - by P.S.Bhimbra, Khanna Publishers.
2. Power Electronics: Circuits, Devices and Applications - by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998.
3. Power Electronics: converters, applications &Design –by Nedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.
4. Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group

Reference Books

1. Power Electronics handbook by Muhammad H. Rashid, Elsevier
2. Elements of Power Electronics-Philip T.Krein. Oxford.
3. Thyristorised Power Controllers-by G.K.Dubey, S R.Doradla, A.Joshi and R.M. K.Sinha,New Age International (P) Limited Publishers, 1996.

Online Learning Resource

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	POWER SYSTEMS AND SIMULATION LAB (Skill Oriented Course)	L	T	P	C
		0	1	2	2

IV Year I Semester

Course Objectives:

The objectives of this course include:

- To do the experiments (in machines lab) on various power system concepts like determination of sequence impedance, fault analysis, finding of sub-transient reactances.
- To draw the equivalent circuit of three winding transformer by conducting a suitable experiment.
- To develop the MATLAB program for formation of Y and Z buses. To develop the MATLAB programs for Gauss-Seidel and fast decoupled load flow studies.
- To develop the SIMULINK model for single area load frequency problem.

Course Outcomes (CO):

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

- Analyze and determine the sequence impedances of both cylindrical rotor and salient pole synchronous machines to understand their behavior under various fault conditions.
- Conduct fault analysis (LG, LL, LLG, and LLLG) on synchronous machines and interpret the impact of these faults on system stability and performance.
- Develop and simulate load flow analysis using various methods (Gauss-Seidel, Newton-Raphson, and Fast Decoupled) and formulate the YBus and ZBus for power system networks.
- Model load frequency control problems for single and two-area systems, employing both uncontrolled and PI-controlled approaches to evaluate system performance.

List of Experiments:

CHOOSE ANY TEN FROM THE FOLLOWING LIST

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine
2. Determination of Sequence Impedances of salient pole Synchronous Machine
3. LG Fault Analysis on an un loaded alternator
4. LL Fault Analysis on conventional phases
5. LLG Fault Analysis
6. LLLG Fault Analysis
7. Determination of Sub transient reactance of salient pole synchronous machine
8. Equivalent circuit of three winding transformer.
9. Y_{Bus} formation using Soft Tools
10. Z_{Bus} formation using Soft Tools
11. Gauss-Seidel load flow analysis using Soft Tools
12. Newton-Raphson load flow analysis using Soft Tools
13. Fast decoupled load flow analysis using Soft Tools
14. Solve the Swing equation and Plot the swing curve
15. Develop a model for a uncontrolled single area load frequency control problem and simulate the same using Soft Tools.
16. Develop a model for PI controlled single area load frequency control problem and simulate the same using Soft Tools.
17. Develop a model for a uncontrolled two area load frequency control problem and simulate the same using Soft Tools.
18. Develop a model for PI controlled two area load frequency control problem and simulate the same using Soft Tools.

Online Learning Resource

1. https://www.ee.iitb.ac.in/~vlabsync/template/vlab/index.html#

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	GENDER SENSITIZATION (Audit Course)	L	T	P	C
		2	0	0	0

IV Year I Semester

Course Objectives:

To enable students to understand the gender related issues, vulnerability of women and men

- To familiarize them about constitutional safeguard for gender equality
- To expose the students to debates on the politics and economics of work
- To help students reflect critically on gender violence
- To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

Course Outcomes(CO):

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

- Understand the basic concepts of gender and its related terminology
- Identify the biological , sociological, psychological and legal aspects of gender

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.

UNITII **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 -

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 - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

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- Just Relationships

Textbooks:

1. A.Suneetha, Uma Bhrugubanda, et al. *Towards a World of Equals: A Bilingual Textbook on Gender*‖, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity.* UK Paperback Edn. March 1990

Reference Books:

1. Wtatt, Robin and Massood, Nazia, *Broken Mirrors: The dowry Problems in India*,London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), *Women in Developing Countries, Assessing Strategies for Empowerment*, London: Lynne Rienner Publishers, 2002
3. Brush, Lisa D., *Gender and Governance*, New Delhi, Rawat Publication, 2007

Online Resources:

1. Understanding Gender

chrome-extension://kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf

https://onlinecourses.swayam2.ac.in/nou24_hs53/preview

2. Gender Roles and Relations

https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes

https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408
https://onlinecourses.swayam2.ac.in/cec23_hs29/preview

3. Gender and Labour

https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed https://onlinecourses.nptel.ac.in/noc23_mg67/preview

4. **GENDER-BASED VIOLENCE**
https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en

https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls
https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

5. **GENDER AND CULTURE**
https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/

https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/

https://archive.nptel.ac.in/courses/109/106/109106136/

Abdulali Sohaila. ―I Fought For My Life…and Won.‖Available online (at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

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COURSES OFFERED FOR HONOURS DEGREE IN EEE

S.No.	Course No.	Course Name	L	T	P	Credits
1.		Advance Power Electronics	3	0	0	3
2.		Distributed Generation & Micro Grids	3	0	0	3
3.		Battery Management Systems	3	0	0	3
4.		Grid Integration of Renewable Energy Systems	3	0	0	3
5.		Electric Vehicle Technology & Mobility	3	0	0	3
6		Advanced Power Electronics Lab	0	0	3	1.5
7		Grid Integration Of Renewable Energy Systems Lab	0	0	3	1.5
Total Credits						**18**

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Electrical and Electronics Engineering

Course Code	ADVANCE POWER ELECTRONICS	L	T	P	C
		3	0	0	3

HONORS IN EEE

Course Objectives:

To make the student learn about

- Classify the resonant converters.
- Modelling techniques used in dc-dc converters
- Application of current mode control on converters
- Role of power electronics and design of closed loop control
- Understand the behavior of semiconductor devices operated as power switches and their protections.

Course Outcomes (CO):

- Analyze and design resonant converters
- Develop power converter models under steady state and small signal conditions
- Application of current mode control of power converters
- Design feedback control systems for power converters
- Synthesize and design magnetic components for power converters

UNIT – I	RESONANT CONVERTERS

Introduction, Basic resonant circuit concepts, Classification -Load resonant converters, Resonant switch converters, zero voltage switching clamped voltage converters, Resonant DC link inverters High frequency link integral half cycle converters, Phase modulated resonant converters, Dual active bridge converters, High gain converters.

UNIT – II	MODELLING OF DC-DC CONVERTERS

Basic ac modeling approach, State space averaging, Circuit averaging and averaged switch modeling, Canonical circuit modeling, Converter transfer functions for buck, boost and buck-boost topologies

UNIT – III	CURRENT MODE CONTROL

Introduction, types, advantages and disadvantages, Slope compensation, Determination of duty cycle and transfer functions for buck, boost and buck-boost converters.

UNIT – IV	DESIGN OF CLOSED LOOP CONTROL

Controller Design: Introduction, mechanism of loop stabilization, Shaping E/A gains vs frequency characteristics, Conditional stability in feed-back loop, Stabilizing a continuous mode forward and fly-back converter, Feedback loop stabilization with current mode control, right plane zero.

UNIT – V	DESIGN OF POWER CONVERTERS COMPONENTS

Design of magnetic components - design of transformer, design of inductor and current transformer - Selection of filter capacitors, Selection of ratings for devices, input filter design, Thermal design

Textbooks

1. M.H. Rashid: Power Electronics-Circuits, Devices & Applications, Pearson, 4th edition, 2013.
2. N. Mohan, T.M. Undeland, W.P. Robbins: Power Electronics: Converters, Applications & Design, J.Wiley & Sons, 3rd edition, 2003.

Reference Books

1. Abraham I. Pressman, Keith Billings &Taylor Morey: Switching Power Supply Design, McGraw Hill International, 3rd Edition, 2009.
2. R.W. Erickson and Dragan Maksimonic: Fundamentals of Power Electronics, Springer, 2nd Edition, 2001.
3. Umanand, L., Power Electronics: Essentials and Applications, John Wiley India, 1st Edition, 2009.

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Course Code	DISTRIBUTED GENERATION & MICRO GRIDS	L	T	P	C
		3	0	0	3

HONORS IN EEE

Course Objectives:

To make the student learn about

- Fundamental concept of distributed generation
- Describe the impact of grid integration.
- Optimal size, placement of distributed generation
- Different control aspects of DG's
- Concept of micro grid and its configuration

Course Outcomes (CO):

- Find the size and optimal placement DG
- Analyze the impact of grid integration and control aspects of DG's
- Analyze the operational issues of the DG's to be connected in the system
- Describe the technical impacts of DG's in power systems
- Analyze a micro grid and modelling of it

UNIT – I	NEED FOR DISTRIBUTED GENERATION

Renewable sources in distributed generation – Current scenario in distributed generation – Planning of DGs – Siting and sizing of DGs – Optimal placement of DG sources in distribution systems.

UNIT – II	GRID INTEGRATION OF DGS

Different types of interfaces – Inverter based DGs and rotating machine-based interfaces – Aggregation of multiple DG units – Energy storage elements – Batteries, ultracapacitors, fly wheels.

UNIT – III	TECHNICAL IMPACTS OF DGS

Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems.

UNIT – IV	ECONOMIC AND CONTROL ASPECTS OF DGS

Market facts, issues and challenges – Limitations of DGs – Voltage control techniques, Reactive power control, Harmonics, Power quality issues – Reliability of DG based systems – Steady state and Dynamic analysis.

UNIT – V	INTRODUCTION TO MICRO-GRIDS

Types of micro-grids – Autonomous and non-autonomous grids – Sizing of micro-grids – Modeling & analysis – Micro-grids with multiple DGs – Micro-grids with power electronic interfacing units – Transients in micro-grids – Protection of micro-grids – Case studies

Textbooks

1. H. Lee Willis, Walter G. Scott , 'Distributed Power Generation – Planning and Evaluation', Marcel Decker Press, 2000.
2. M.Godoy Simoes, Felix A.Farret, 'Renewable Energy Systems – Design and Analysis with Induction Generators', CRC press.
3. Nikos Hatziargyriou , Microgrids: Architectures and Control (Wiley - IEEE), 2014.

Reference Books

1. Abraham I. Pressman, Keith Billings &Taylor Morey: Switching Power Supply Design, McGraw Hill International, 3rd Edition, 2009.
2. R.W. Erickson and Dragan Maksimonic: Fundamentals of Power Electronics, Springer, 2nd Edition, 2001.
3. Umanand, L., Power Electronics: Essentials and Applications, John Wiley India, 1st Edition, 2009.

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Course Code	BATTERY MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

HONORS IN EEE

Course Objectives:

- Understand the basics of batteries and its parameters
- Apply the concepts to create Battery Management System
- Create Physical and Simulation models for Battery Management System
- Design different Battery Management Systems

Course Outcomes (CO):

After completion of this course, student will be able to

- Understand the role of battery management system
- Identify the requirements of Battery Management System
- Interpret the concept associated with battery charging / discharging process
- Analyze various parameters of battery and battery pack
- Design the model of battery pack

UNIT – I	INTRODUCTION

Introduction to Battery Management System, Cells & Batteries, Nominal voltage and capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel, Electrochemical and lithium-ion cells, Rechargeable cell, Charging and Discharging Process, Overcharge and Undercharge, Modes of Charging

UNIT – II	BATTERY MANAGEMENT SYSTEM

Introduction and BMS functionality, Battery pack topology, BMS Functionality, Voltage Sensing, Temperature Sensing, Current Sensing, BMS Functionality, High-voltage contactor control, Isolation sensing, Thermal control, Protection, Communication Interface, Range estimation, State-of charge estimation, Cell total energy and cell total power

UNIT – III	BATTERY STATE OF CHARGE AND STATE OF HEALTH ESTIMATION

Battery state of charge estimation (SOC), voltage-based methods to estimate SOC, Model-based state estimation, Battery Health Estimation, Lithium-ion aging: Negative electrode, Lithium ion aging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing

UNIT – IV	MODELLING AND SIMULATION

Equivalent-circuit models (ECMs), Physics-based models (PBMs), Empirical modelling approach, Physics-based modelling approach, Simulating an electric vehicle, Vehicle range calculations, Simulating constant power and voltage, Simulating battery packs

UNIT – V	DESIGN OF BATTERY MANAGEMENT SYSTEMS

Design principles of battery BMS, Effect of distance, load, and force on battery life and BMS, energy balancing with multi-battery system

Textbooks

1. Plett, Gregory L. Battery management systems, Volume I: Battery modelling. Artech House, 2015.
2. Plett, Gregory L. Battery management systems, Volume II: Equivalent-circuit methods. Artech House, 2015.

Reference Books

1. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002.
2. Davide Andrea," Battery Management Systems for Large Lithium-ion Battery Packs" Artech House, 2010
3. Pop, Valer, et al. Battery management systems: Accurate state-of-charge indication for battery-powered applications. Vol. 9. Springer Science & Business Media, 2008.

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Course Code	GRID INTEGRATION OF RENEWABLE ENERGY SYSTEMS	L	T	P	C
		3	0	0	3

HONORS IN EEE

Course Objectives:

To make the student learn about

- Operation and control on the issues related to the integration of distributed renewable generation into the network.
- Power system equipment's used for integration.
- Power quality and its management along with approaches for grid stabilization.
- Interpret grid stabilization scheduling and dispatch
- Deep understanding about integration techniques for RE sources.

Course Outcomes (CO):

- Explain operation and control on the issues related to the integration of distributed renewable generation into the network.
- Analysis of stability in power system integration using synchronous generators and induction generators.
- Determine challenges and issues in integration of renewable sources
- Interpret the load scheduling and dispatch
- Analysis of ac and dc integration techniques for multiple resources.

UNIT – I	INTRODUCTION

Various techniques of utilizing power from renewable energy sources, concept of nano/micro/mini grid. Need of integrating large renewable energy sources, issues related to integration of large renewable energy sources, rooftop plants. Concept of VPP.

UNIT – II	POWER SYSTEM EQUIPMENTS FOR GRID INTEGRATION SYNCHRONOUS GENERATOR

Synchronization/integration to existing grid, load sharing during parallel operation, stability (swing equation and solution) Induction Generator: working principle, classification, stability due to variable speed and counter measures Power Electronics: need of power electronic equipments in grid integration, converter, inverter, chopper, ac regulator and cyclo converters for AC/DC conversion.

UNIT – III	POWER QUALITY AND MANAGEMENT

THD, voltage sag, voltage swell, frequency change and its effects, network voltage management, frequency management, system protection, grid codes

UNIT – IV	GRID STABILIZATION

Scheduling and dispatch, Forecasting, reactive power and voltage control, frequency control, operating reserve, storage systems, electric vehicles Ancillary services in Indian Electricity Market (regulatory aspect), CERC and CEA orders (technical and safety standards)

UNIT – V	INTEGRATION OF ALTERNATE SOURCES OF ENERGY

Introduction, principles of power injection: converting technologies, power flow; instantaneous active and reactive power control approach; integrating multiple renewable energy sources; DC link integration; AC link integration; HFAC link integration; islanding and interconnection

Textbooks

1. Integration of Alternative sources of Energy, Felix A. Farret and M. Godoy Simoes, IEEE Press – Wiley-Interscience publication, 2006.
2. Grid integration of solar photovoltaic systems, Majid Jamil, M. Rizwan, D.P.Kothari, CRC Press (Taylor & Francis group), 2017

3. Renewable Energy Grid Integration, Marco H. Balderas, Nova Science Publishers, New York, 2009.
4. Wind Power Integration connection and system operational aspects, B. Fox, D. Flynn L. Bryans, N. Jenkins, M. O' Malley, R. Watson and D. Milborrow, IET Power and Energy Series 50 (IET digital library), 2007

Reference Books

1. Power Generation, Operation, and Control, Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheblé, John Wiley & Sons, New York, 2013 (3rd edition)
2. Power Electronics: Circuits, Devices, and Applications. M.H.Rashid, Pearson Education India, 2013
3. Advanced power system analysis and dynamics, L.P.Singh, New age international publishers, 2017

Online Learning Resource

Sri Krishnadevaraya University College of Engineering & Technology
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Electrical and Electronics Engineering

Course Code	ADVANCED POWER ELECTRONICS LAB	L	T	P	C
		0	0	3	1.5

HONORS IN EEE

Course Objectives:

The objectives of this course include:

- To understand the operation and characteristics of various power electronic converters ar inverters.
- To analyze the performance of DC–DC, DC–AC, and AC–DC converter topologies.
- To study gate driver circuits and PWM control strategies for power electronic switches.
- To evaluate the performance of converters under different load and supply conditions.

Course Outcomes (CO):

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

- Demonstrate the operation of different power electronic converters.
- Analyze voltage and current waveforms of converters and inverters.
- Design PWM control techniques for power conversion applications.
- Evaluate the performance of converters for resistive, inductive, and motor loads.

List of Experiments:

1. Study of characteristics of SCR, MOSFET, and IGBT.
2. Simulation of single-phase controlled rectifier using MATLAB/Simulink.
3. Speed control of DC motor using single-phase converter.
4. Design and testing of a step-down (buck) converter.
5. Design and testing of a step-up (boost) converter.
6. Simulation of single-phase inverter with PWM control.
7. Implementation of single-phase AC voltage controller.
8. Simulation of three-phase inverter using SPWM technique.
9. Study of single-phase cycloconverter operation.
10. Performance evaluation of DC–DC converter feeding RL load.
11. Hardware implementation of DC motor control using MOSFET-based chopper.
12. Study of gate driver circuits for IGBT-based inverters.

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Course Code	GRID INTEGRATION OF RENEWABLE ENERGY SYSTEMS LAB	L	T	P	C
		0	0	3	1.5

HONORS IN EEE

Course Objectives:

The objectives of this course include:

- To understand the interconnection principles of renewable energy sources with the electr cal grid.
- To study power electronic interfaces for solar and wind energy systems.
- To analyze grid synchronization, power quality, and protection issues.
- To evaluate the performance of renewable systems under grid-connected and standalone conditions.

Course Outcomes (CO):

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

- Demonstrate grid-connected and standalone operation of renewable energy systems.
- Implement inverter control strategies for grid integration.
- Analyze the impact of renewable energy integration on power quality and system stability.
- Evaluate the performance parameters of solar PV and wind systems under varying conditions.

List of Experiments:

List of Experiments:

1. Study of grid interconnection requirements and standards for renewable energy systems.
2. Simulation of grid-connected solar PV system using MATLAB/Simulink.
3. Modeling and analysis of wind energy system integrated with the grid.
4. Study of Maximum Power Point Tracking (MPPT) algorithms for PV systems.
5. Implementation of inverter control for grid synchronization.
6. Analysis of power quality issues due to renewable integration.
7. Simulation of grid-tied inverter under unbalanced grid conditions.
8. Performance evaluation of standalone solar PV system with load variation.
9. Study of protection schemes for grid-connected renewable energy systems.
10. Study of hybrid renewable energy system (Solar–Wind) integration with grid.
11. Implementation of grid synchronization using PLL techniques.
12. Case study on grid integration of distributed renewable sources in microgrids.

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COURSES OFFERED FOR MINORS OFFERED BY EEE

S.No	Course Code	Course Name	L	T	P	Credits
1.		DC Machines	3	0	0	3
2.		AC Machines	3	0	0	3
3.		Electrical Measurements & instrumentation	3	0	0	3
4.		Basics of Control systems	3	0	0	3
5		Power Electronics	3	0	0	3
6		Electrical Machines Laboratory	0	0	3	1.5
7		Control Systems and Instrumentation Laboratory	0	0	3	1.5

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Course Code	DC MACHINES	L	T	P	C
		3	0	0	3

MINORS

Course Objectives:

To make the student learn about

- The course will impart the concepts and principle of electromechanical energy conversions in rotating DC machines
- The constructional features of DC machines and different types of winding employed in DC machines and the phenomena of armature reaction and commutation
- Characteristics of generators and parallel operation of generators
- Methods for speed control of DC motors and applications of DC motors
- Various types of losses that occur in DC machines , how to calculate efficiency and Testing of DC motors

Course Outcomes (CO):

- Able to understand the electromechanical energy conversion system.
- Able to understand the construction, operation and armature windings of a DC generator.
- Able to analyze parallel operation of DC Generators.
- Able to analyze speed control of DC motors, testing methods and parallel operation of DC machines.
- Able to understand and analyze the speed control of DC motors.

UNIT – I	PRINCIPLES OF ELECTROMECHANICAL ENERGY CONVERSION

Energy in magnetic system, field energy and mechanical force, multiply-excited magnetic field systems, forces/torques in systems with permanent magnets, energy conversion via electric field, dynamical equations of electro mechanical systems.

UNIT – II	D.C GENERATORS

D.C GENERATORS: Principle of operation-Elementary Generator - Constructional details - types of armature windings - E.M.F. equation - Types of DC generators - Power division - problems Armature reaction-ATd/Pole,ATc/Pole -simple problems -Remedies for field distortion –- Compensating winding - commutation - methods of improving commutation.

D.C GENERATORS- CHARACTERISTICS: Characteristics of DC generators - building up of e.m.f of self excited dc shunt generator - causes for failure - critical field resistance and critical speed - characteristics of shunt, series and compound generators.

UNIT – III	PARALLEL OPERATIONS OF DC GENERATOR

Applications of DC generators - parallel operation of DC generators -reasons for paralleling - requirements - paralleling of shunt, compound generators - use of equalizer bar.

UNIT – IV	DC MOTORS

Principle of operation - back or counter e.m.f - comparison between motor and generator action - torque developed - Mechanical power developed by a DC motor -types of DC motors - motors characteristics - comparison of DC motor characteristics.

UNIT – V	SPEED CONTROL OF DC MOTORS & LOSSES, EFFICIENCY AND TESTING OF DC MACHINES

SPEED CONTROL OF DC MOTORS: applications of DC motors - speed control of DC motors. Starting of dc motors - starters for shunt, series and compound motors, -calculation of starter steps for DC shunt motor.

LOSSES, EFFICIENCY AND TESTING OF DC MACHINES: Losses & efficiency - losses-copper, iron, mechanical - efficiency of DC machines - condition for maximum efficiency-Brake test-Swinburne's test-Hopkinson's test - Retardation test - Field's test.

Textbooks

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. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004.
3. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.

Online Learning Resource

Sri Krishnadevaraya University College of Engineering & Technology
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Electrical and Electronics Engineering

Course Code	AC MACHINES	L	T	P	C
		3	0	0	3

MINORS

Course Objectives:

- Analyze and apply load test, no-load and blocked-rotor tests for construction of circle diagram and equivalent circuit determination in a single phase induction motor.
- Predetermine regulation of a three-phase alternator by synchronous impedance & m.m.f methods.
- Predetermine the regulation of Alternator by Zero Power Factor method Xd and Xq determination of salient pole synchronous machine.
- Evaluate and analyze V and inverted V curves of 3 phase synchronous motor.

Course Outcomes (CO):

By the end of the course, the student will be able to:

- Analyze and apply load test, no-load and blocked-rotor tests for construction of circle diagram and equivalent circuit determination in a single phase induction motor.
- Predetermine the regulation of a three-phase alternator by synchronous impedance &
- m.m.f methods.
- Predetermine the regulation of Alternator by Zero Power Factor method Xd and Xq determination of salient pole synchronous machine.
- Evaluate and analyze V and inverted V curves of 3 phase synchronous motor.

UNIT – I	FUNDAMENTALS OF AC MACHINE WINDINGS

Physical arrangement of windings in stator and cylindrical rotor; concentrated winding, distributed winding, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factors.

UNIT – II	THREE PHASE INDUCTION MACHINES

Operating principle, Construction, Types (squirrel cage and slip-ring), Starting and Maximum Torque, Equivalent circuit, Phasor Diagram, Torque-Slip Characteristics, power flow in induction machines, Losses and Efficiency, No load and blocked rotor test, Circle diagram, performance characteristics, Numerical problems. Methods of starting, braking and speed control for induction motors, Doubly-Fed Induction Machines, crawling and cogging. Analysis of 3 phase induction motors with single phasing operation

UNIT – III	SYNCHRONOUS GENERATORS

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation, EMF, MMF, ZPF and ASA methods. Operating characteristics of synchronous machines, Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.

UNIT – IV	SYNCHRONOUS MOTORS

Principle of operation, methods of starting, Phasor diagram of synchronous motor, variation of current and power factor with excitation, V and inverted V curves, Hunting and use of damper bars, Synchronous condenser and power factor correction, Excitation and power circles.

UNIT – V	SINGLE-PHASE INDUCTION MOTORS & SPECIAL MACHINES

Constructional features double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and its applications, capacitor start and run single phase motors, reluctance single phase motors, stepper motors, BLDC motors.

Textbooks

1. Electric Machines – by I.J.Nagrath & D.P.Kothari, Tata Mc Graw-Hill Publishers, 4th Edition,2010.
2. Electrical Machines – by P.S. Bimbra, Khanna Publishers.

Reference Books

1. The Performance and Design of A.C.Machines – by M.G.Say, ELBS and Ptiman & Sons.
2. Electric Machinery – by A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw-Hill Companies,5th edition, 1990.
3. Theory of Alternating Current Machinery by Langsdorf, Tata Mc Graw-Hill, 2nd edition.
4. Electromachanics-III (Synchronous and single phase machines), S.Kamakashiah, Overseaspublishers Pvt Ltd.
5. Electric Machines - by M. S. Sarma and M. K. Pathak, CENGAGE Learning.

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Course Code	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		3	1	0	4

MINOR

Course Objectives:

The objective of this course is to acquire knowledge on

- Classification and usage of various meters to measure current & voltage
- Applications of potentiometers & instrument transformers.
- Measurement of active power, reactive power and energy
- Resistance, inductance and capacitance measuring methods.
- Characteristics and applications of transducers.

Course Outcomes (CO):

The student should be able to

- Compare the different types of measuring instruments, their construction, operation and characteristics.
- Measure the voltage and current through potentiometers and instrument transformers
- Choose the suitable method for measurement of active, reactive powers and energy.
- Apply the suitable method for measurement of resistance, inductance and capacitance.
- Apply the knowledge about transducers effectively.

UNIT – I **INTRODUCTION TO MEASURING INSTRUMENTS**

Classification-deflecting, control and damping torques-Ammeters and Voltmeters-PMMC, moving iron type instruments- expression for the deflecting torque and control torque-errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type- Extension of range of E.S. Voltmeter.

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 types 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. Singlephase 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, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle - Desauty 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

Textbooks
1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co.Publications 2. Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis, fifth Edition, Wheeler Publishing. 3. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.
Reference Books
1. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand. 2. Electrical Measurements by Buckingham and Price, Prentice – Hall 3. Electrical Measurements by Forest K. Harris. John Wiley and Sons 4. Electrical Measurements: Fundamentals, Concepts, Applications byReissland, M.U, New Age International (P) Limited, Publishers. 5. Electrical and Electronic Measurements by G.K.Banerjee, PHI Learning Private Ltd, New Delhi–2012
Online Learning Resource

Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Electrical and Electronics Engineering

Course Code	BASICS OF CONTROL SYSTEMS	L	T	P	C
		3	1	0	4

Course Objectives:

The objective of this course is to acquire knowledge on

- Mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
- Time response of first and second order systems and improvement of performance by proportional plus derivative and proportional plus integral controllers and to investigate the stability of closed loop systems using Routh's stability criterion and the analysis by root locus method.
- Frequency Response approaches for the analysis of linear time invariant (LTI) systems using Bode plots, polar plots and Nyquist stability criterion.
- Basic aspects of design and compensation of linear control systems using Bode plots.
- State models and analyze the systems and also the concepts of Controllability and Observability

Course Outcomes (CO):

The student should be able to

- Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
- Determine time response specifications of second order systems and absolute and relative stability of LTI systems using routh's stability criterion and the root locus method
- Analyze the stability of LTI systems using frequency response methods.
- Design lag, lead, lag-lead compensators to improve system performance from bode diagrams.
- Represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability.

UNIT – I **MATHEMATICAL MODELING OF CONTROL SYSTEMS**

Classification of control systems, open loop and closed loop control systems and their differences, Feedback characteristics, transfer function of linear system, differential equations of electrical networks, translational and rotational mechanical systems, transfer function of DC servo motor – AC servo motor – synchro, transmitter and receiver – block diagram algebra – representation by signal flow graph – reduction using Mason's gain formula.

UNIT – II **TIME RESPONSE ANALYSIS**

Standard test signals – time response of first and second order systems – time domain specifications, steady state errors and error constants, effects of proportional (P), proportional-lintegral (PI),proportional-integral-derivative (PID) systems.

The concept of stability – Routh's stability criterion – limitations of Routh's stability, root locus concept – construction of root loci (simple problems), Effect of addition of Poles and zeros to the transfer function

UNIT – III **FREQUENCY RESPONSE ANALYSIS**

Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram – phase margin and gain margin – stability analysis from Bode plots, Polar plots, Nyquist stability criterion.

UNIT – IV **CLASSICAL CONTROL DESIGN TECHNIQUES**

Lag, lead, lag-lead compensators, design of compensators using Bode plots.

UNIT – V **STATE SPACE ANALYSIS OF LTI SYSTEMS**

Concepts of state, state variables and state model, state space representation of transfer function, diagonalization, solving the time invariant state equations, State Transition Matrix and it's Properties, concepts of controllability and observability.

Textbooks

1. Control Systems principles and design by M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th edition.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

Reference Books

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems by Manik Dhanesh N, Cengage publications.
3. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
4. Control Systems Engineering by S.Palani, Tata McGraw Hill Publications

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Course Code	POWER ELECTRONICS	L	T	P	C
		3	0	0	3

MINORS

Course Objectives:

The objective of this course is to acquire knowledge on

- To introduce the basic principles and applications of power semiconductor devices.
- To understand the operation and performance of controlled rectifiers, choppers, and inverters.
- To study the control of electrical machines using power electronic converters.
- To familiarize students with industrial applications of power electronic circuits.

Course Outcomes (CO):

The student should be able to

- Explain the working principles of power semiconductor devices.
- Analyze converter, chopper, and inverter circuits.
- Apply power electronic converters for controlling DC and AC drives.
- Evaluate performance of power electronic systems in industrial applications.

UNIT – I

Unit – I: Power Semiconductor Devices

Introduction to Power Electronics – Characteristics of SCR, TRIAC, DIAC, MOSFET, and IGBT – Triggering and Commutation Circuits – Gate Drive Circuits and Protection.

UNIT – II

Unit – II: AC–DC Converters (Controlled Rectifiers)

Principle of Operation – Single Phase and Three Phase Half-wave and Full-wave Controlled Converters – Performance Analysis – Effect of Firing Angle – Power Factor Improvement.

UNIT – III **FREQUENCY RESPONSE ANALYSIS**

Unit – III: DC–DC Converters (Choppers)

Principle of Step-up and Step-down Choppers – Classification and Operation of Buck, Boost, and Buck–Boost Converters – PWM Techniques – Applications in DC Motor Control.

UNIT – IV

Unit – IV: DC–AC Converters (Inverters)

Single Phase and Three Phase Inverters – Operation and Waveform Analysis – Voltage and Frequency Control – Sinusoidal PWM – Applications in AC Drives.

UNIT – V

Unit – V: AC–AC Converters and Applications

Single Phase and Three Phase AC Voltage Controllers – Cycloconverters – Industrial Applications of Power Electronics such as Induction Heating, Welding, and Speed Control of Motors

Textbooks

1. M. H. Rashid, *Power Electronics: Circuits, Devices and Applications*, Pearson Education, 4th Edition, 2013.
2. P. S. Bimbhra, *Power Electronics*, Khanna Publishers, 5th Edition, 2012.

Reference Books

1. Ned Mohan, Tore M. Undeland, and William P. Robbins, *Power Electronics: Converters, Applications and Design*, Wiley India Pvt. Ltd., 3rd Edition, 2014.
2. Cyril W. Lander, *Power Electronics*, McGraw Hill Education, 3rd Edition, 1993.
3. Singh M. D. and K. B. Khanchandani, *Power Electronics*, Tata McGraw Hill Education, 2nd

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Course Code	ELECTRICAL MACHINES LABORATORY	L	T	P	C
		0	0	3	1.5

MINORS

Course Objectives:

The objectives of this course include:

- To understand the characteristics and performance of DC and AC machines.
- To conduct tests for determining efficiency and regulation of electrical machines.

Course Outcomes (CO):

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

- Perform load tests on DC and AC machines.
- Determine efficiency, regulation, and torque–speed characteristics.
- Interpret results and analyze machine performance.

List of Experiments:

1. Load test on DC shunt motor.
2. Speed control of DC shunt motor.
3. Load test on DC shunt generator.
4. Open circuit and short circuit tests on single phase transformer.
5. Load test on single phase transformer.
6. Load test on three phase induction motor.
7. Determination of equivalent circuit of three phase induction motor.
8. Regulation of alternator by EMF and MMF methods.
9. V and inverted V curves of synchronous motor.

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Course Code	CONTROL SYSTEMS AND INSTRUMENTATION LABORATORY	L	T	P	C
		0	0	3	1.5
MINORS					

Course Objectives:

The objectives of this course include:

- To familiarize students with control system components and instrumentation devices.
- To study system response and design controllers for electrical applications.

Course Outcomes (CO):

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

- Analyze characteristics of transducers and control components.
- Determine time and frequency response of control systems.
- Design and implement PID controllers for speed and position control.

List of Experiments:

1. Calibration of LVDT and measurement of displacement.
2. Study of synchros – transmitter and receiver characteristics.
3. Temperature measurement using RTD and thermocouple.
4. Speed control of DC motor using open loop and closed loop systems.
5. Time response of first and second order systems.
6. Frequency response of second order system.
7. Determination of transfer function of DC motor.
8. PID controller design for motor speed control.
9. Study of stepper motor and servo motor characteristics.